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*Telephone: Trafalgar 6171 (Private Branch Exchange)*
*Telegraphic Address:, "Zacatecas, Rand London."*


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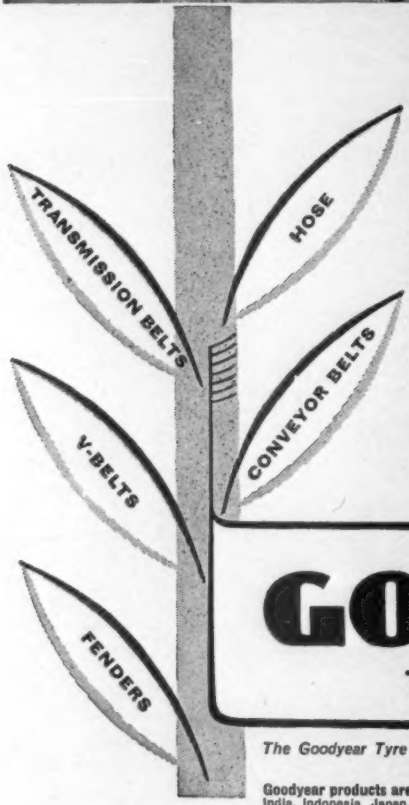


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IRON AND COAL
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# Central Heating

THE pattern of fuel usage resulting from the establishment of Smoke Control Areas is now beginning to emerge. The first indications do not necessarily give a true picture of what the final pattern will be, but the trend in various districts in London—a vital area—is nevertheless sufficiently consistent to be accepted as a guide to the future. There can be no doubt that these initial changes in fuel demand, taken in conjunction with the public attitude towards central heating, have an important bearing on the future of the coal industry as well as on gas, electricity, and oil.

A survey made recently showed a surprising lack of knowledge among the public with regard to central heating. While the twin beliefs that central heating is "expensive" and difficult to instal may partially explain the small proportion of "middle class" householders who are considering having it in their homes, a general survey of the results of this investigation suggests that there is a further reason which may, in fact, be the most important. This could be summed up by saying that a fairly high proportion of the people who answered questions showed considerable ignorance of central heating and central-heating systems. A very large proportion could make no answer to the questions on costs, and nearly 20 per cent. could not name any type of fuel used in central-heating systems.

Most people would be very pleased to find central heating installed in a new home, but it would require a much greater stimulus than has yet been received before they would consider having it installed in their present homes. There is a general approval of central heating: well over half of the middle-class householders replying to a questionnaire consider that central heating is a very good, even the ideal, method of heating. But this approval is very general. The idea of they themselves having central heating has not seriously entered most peoples' minds. The reasons for this are associated with the belief that central heating is for the well-to-do only, or that it is difficult to instal. There are also objections on the ground that it creates a stuffy or unhealthy atmosphere. A subsidiary factor is the belief that it is an alternative to, for example, coal fires rather than a supplementary form of heating.

It would seem that the middle classes need to be much better informed about the merits of central heating before any widespread acceptance of the idea becomes possible. To be successful, an educational campaign would have to satisfy the public on the following four points:—

1.—That central heating is not a luxury and the prerogative of the very rich. In other words, that central heating, when compared with the cost of other consumer goods, is a "good buy."

2.—That the installation of a central-heating system would not involve major structural alterations to an existing home; and that there are alternative systems to suit the particular demands of different types of household.

3.—That the running costs of central heating compare favourably with other forms of heating.

4.—That central heating is not necessarily unhealthy.

This lack of awareness cannot last, for people are becoming more and more comfort and labour-saving minded. At one time some coal distributors tended to look on central heating as an enemy. The reduction in domestic tonnage resulting from a central-heating plant doing the work of a large number of individual and—let it be accepted—old-fashioned, extravagant grates represented quite a serious loss of tonnage. Times have changed, and most coal merchants look upon central heating as a potential ally in the fierce competitive battle for the domestic heating load. Many consumers are looking for an alternative to the open coal fire, and, if their custom is to be retained for solid fuel, it is to central heating that their attention must be directed. Some remain ardent supporters of the modern open fire—it is true and it is welcome—but others will turn to gas, electricity, or oil unless the advantages of central heating by solid fuel are impressed upon them.

One of the greatest advances in bringing central heating to the forefront of public interest was the development of the system of small-bore heating by the British Coal Utilisation Research Association, and its wider adoption should provide further opportunities for coal. The system is equally effective whatever type of boiler is installed, but once the householder has decided to change to this method of heating it should not be difficult to satisfy him that it can be more economically run on solid fuel.

Coal distributors would be well advised to accept the position that their future must include recognition of the fact that central heating is their ally in retaining the trade for solid fuel and that they must be prepared to offer their customers all the help and advice possible. This envisages a state of affairs where the backing of the Coal Utilisation Council is essential, and where the relationship with the producers of coke as well as of other

boiler fuels must be based on the closest co-operation. As central heating becomes more and more accepted as a normal rather than an exceptional amenity, so will the boiler fuel trade become a more and more prominent feature of the domestic fuel pattern.

It is not, however, only the anticipated extension of central heating which is going to set the new pattern. The establishment of Smoke Control Areas is likely to make an even greater impact on the public's choice of fuel. If the coal trade is to make the most of the opportunities which will still exist to sell solid fuel, it must study the trend of demand in the Areas already in operation.

From inquiries directed to a cross-section of Smoke Control Areas in London, it appears that 63 per cent. of people now use open fires compared with 79 per cent. formerly. This is despite a substantial increase in the number of improved open grates, which did not compensate for the large decrease in the number of old grates. The variation between one part of London and another is striking. In one area the figures are: formerly 70 per cent., now 38 per cent.; in another area, formerly 78 per cent., now 73 per cent.

What will surprise many people is the small increase in the use of gas fires which the response to the inquiry reveals. Over the whole area covered by the inquiry the percentage using gas fires has increased only from 10 per cent. to 13 per cent., whereas the percentage using electric fires has gone up from 51 per cent. to 63 per cent., and oil heaters from 35 per cent. to 46 per cent. It seems doubtful if this tendency for the domestic heating load to be transferred to electricity (mainly at peak periods) and to oil (an imported fuel) is in the best interests of the country. Certainly it is contrary to the oft-repeated statement that for many years to come the main burden of domestic heating should be carried by solid fuel.

## Reluctance in Enforcing Clean Air Act

PURPOSE of the Clean Air Act is being delayed by a large proportion of local authorities in areas judged to be "black." A White Paper published by the Ministry of Housing states that by the end of March, 115 of the 324 local authorities in "black" areas had failed to submit programmes. The Ministry says that the commonest reason given was that authorities did not consider their district to be a "black" area. This was particularly so in Wales, where many authorities pointed to the relative smokelessness of Welsh house coal.

Another common excuse was that authorities were concerned about the effect of smoke-control orders on people burning concessionary coal. The Ministry is sending a circular to local authorities asking them to review the situation.

## *Passing Thoughts . . .*

AS a nation we have a genius for understatement and self-criticism, which (however admirable) leads our foreign friends and enemies alike to underrate us . . . We have also (most fortunately) a tenacity and an underlying common sense and capacity for workable compromise which over the centuries have served us—and the world in general—fairly well on the whole. In recent years, however, there has grown up among us a mentality of dependence on the State and of personal irresponsibility which, if we are to maintain our position and discharge its obligations (or even to survive) must be replaced by a revival of our ancient virtues of thrift, individual self respect, and independence.—MR. W. H. HIGGINBOTHAM, chairman of Edgar Allen & Company, Limited, steelmakers and engineers, of Sheffield.

> *We are well aware that it is at present impracticable for all coke to be stored and transported under cover from rain and snow, and we realize therefore that it is liable at times to be delivered to consumers containing excessive moisture. In our view, however, it is grossly unfair to expect consumers to pay for this excessive moisture as if it were coke.*—MRS. F. H. CANTWELL, *chairman of the Domestic Coal Consumers' Council.*

It would be foolishness to suppose that there is nothing to worry about in the economic outlook. The main anxiety centres on exports, the trend of which has been frankly disappointing. It may be that the trend will improve in the second half of the year . . . But it is difficult to foresee in the short term an export expansion on the scale that is necessary to remove all anxiety about the balance of payments and to permit the early dismantling of the restraints on economic expansion.—The Financial Times.

> *The publicity required for British goods is more widespread experience of punctual deliveries, designs suited to the market, and of course keen prices and salesmanship. If taxpayers are to pay for an additional [publicity] executive attached to Embassies abroad, they will get better value for their money if he turns his efforts to helping home manufacturers to make proper use of their market opportunities, and also to bringing home to them the point of view of their customers and agents.—Letter in the Financial Times.*

Experience proves, I am sure that exhortation [to increase exports], group meetings, luncheons, dinners and conferences are just not enough. What a small firm needs is positive assistance which must include accurate and topical market facts, being put in touch with the right sort of selling set-up to suit the circumstances and, if it were only possible, some sort of incentive other than the services of the Export Credits Guarantee Department, which are possibly more applicable to big firms.—MR. ROGER FALK, chairman, British Export Trade Research Organization (1952), Limited, in a letter to The Times.

> *It seems obvious that oil at the door will always be cheaper to the heat user than oil converted in gasification processes. But there are other factors than the comparative cost of fuels, the most important being convenience to the user . . . I admit that my own house is soon to have gas heating, electric heating, and a coal fire.*—MR. A. T. HENLEY, *managing director, Oil-Age Boiler Company, Limited, London, S.W.1, in a letter to the Financial Times.*

# AEI—Davy-United Link

## JOINT AUTOMATION UNIT TO CUT COSTS IN STEELWORKS

IMPORTANT step towards meeting rapidly increasing requirements for automation in the steel and allied industries has been taken by Associated Electrical Industries, Limited, and Davy-United, Limited. The two companies have joined forces to finance a steelworks automation unit to apply new automation techniques to the processing of steel. Its object will be to help reduce costs, and to increase productivity in Britain's steel industry. It is also intended for these techniques to be applied to non-ferrous metal production.

AEI points out that the problems involved in full automation in the steel and allied industries are too complex for any single existing manufacturing organization to deal with adequately within its own resources.

It has therefore allied with Davy-United to establish this combined unit which has been specifically organized to tackle such problems, from the stage of initial design study to the commissioning of a fully operational production system in a plant.

### Improved Productivity

AEI'S long experience in the development of electronic and electrical equipment is combined with that of Davy-United in building steelworks plant and developing specialized control for steelworks, and the new unit will be backed by the large research resources of the two companies.

This will enable it to undertake comprehensive automation projects which can be expected to offer considerable long-term benefits in improved productivity and economy of operation. Such projects will include the combination of advanced servo controls with computers to ensure optimum performance of rolling mills and associated plant.

A spokesman for AEI said: "It is impossible to give any idea of the finance involved at the moment, but the link-up means that the costs of special development projects and research will be shared. Some of the initial work by the unit will be to discuss with steel companies their special problems in introducing advanced methods of automation."

The unit is believed to be the first of its k'nd in Britain, and possibly in the world. In the past not only AEI, but the General Electric Company, Limited, and the English Electric Company, Limited, have produced a considerable amount of control equipment for steelworks. The idea of forming a joint unit was evolved over a period of six months. The services of the unit will be available to both British and foreign steel concerns.

The unit's headquarters are at Mill Road, Rugby. It has representatives at Davy-United, Sheffield, and the AEI heavy plant division, Rugby.

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FOUR WHOLLY-OWNED SUBSIDIARIES of the English Steel Corporation, Limited, Sheffield—English Steel Forge & Engineering, English Steel Rolling Mills, English Steel Tool, and English Steel Magnets—will jointly show items of interest from their selection of high quality steels and steel products manufactured for the aircraft industry at the Farnborough Flying Display from September 5-11.

## Talks on Second Stage of Indian Steel Plan

PREPARATORY talks have started on the financing of the second stage of the Durgapur steelworks which is being constructed in India by ISCON—a consortium of 13 UK engineering and electrical companies. The first stage is due for completion in about 12 months' time and the completed plant will have an annual steel capacity of 1,000,000 ingot tons.

Under the third Five Year Plan, the Indian Government intends to increase capacity by a further 600,000 tons. The cost of the second stage is estimated at £50,000,000, half of which will have to be found in foreign exchange. Britain provided £26,500,000 for the first stage in the form of credits, £15,000,000 on a Government to Government basis, and £11,500,000 in the form of a loan from a consortium of banks.

With the talks still in a preliminary stage, an important aspect of the situation is the Indian Government's need for a long repayment period for at least the bulk of the money which might be forthcoming. For this reason it seems likely that something like £18,000,000 to £20,000,000 of the £25,000,000 required in foreign exchange will be made available in the form of a Government loan under Section 3 of the Export Credits Act.

While it may be some time before talks reach the stage of actual negotiation, the Indian Minister for Steel, Mr. Swaran Singh, is due to visit Britain in September and the financing of the next stage of Durgapur is likely to be the main item on his agenda.

## *South Africa Cuts Iron and Steel Exports*

OVERALL demand in the Union of South Africa for steel products during the past month has remained strong and ISCOR has continued to produce at full capacity. There were minor signs of weakening in demand for certain products, but these were relatively insignificant and all steel products rolled at ISCOR continued to be distributed on an allocation basis. Demand for cold rolled sheets and wire continued to exceed production capacity by a wide margin as, to a lesser extent, was the case with galvanized flat and corrugated sheets and heavy mill sections.

The increase in the local demand for pig-iron has continued and exports of pig-iron suitable for the local market have now been discontinued. Imports of rolled steel products showed further increases.

*Personal*

# Round the World Export Tour

MR. G. A. BLACK, export director of Martin, Black & Company (Wire Ropes), Limited, Coatbridge, near Glasgow, begins a three-month round the world export tour tomorrow (Saturday) when he leaves Scotland by air for Calcutta. Places he will visit include Malaya, Singapore, Hong Kong, the Philippines, the USA and Canada. Mr. Black returns to the UK on October 30.

MR. G. A. BLACK

Oversea tours such as this one are not new to Mr. Black, who is also a director of Martin Black Wire Ropes (Canada), Limited. Last year, accompanied by Mr. A. D. Martin, joint managing director, he made an extensive tour of Canada and America as part of the Scottish firm's expansion plans. Mr. Martin will be joining Mr. Black for the last four weeks of this tour.

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After 21 years as underground engineer at Cortonwood Colliery (Yorks) Mr. GEORGE ROWLANDS has retired.

Chairman of the Cementation, Limited, group of companies, Mr. A. R. NEELANDS, left on Saturday on a six-week business tour of Canada and the US.

Mr. J. H. UNSWORTH, Group manager of No. 4 Group, No. 1 Area, North-Western Divisional Coal Board, has retired. He has been in the industry for over 50 years.

Mr. W. M. INGLIS, managing director of James Troop & Company, Limited, engineers, shiprepairers, etc., of Liverpool, has been re-elected president of the Mersey Ship Repairers' Association.

Presentation was made recently to Mr. WILLIAM BRADFORD on his retirement as manager of the Cleckheaton wire mills of British Ropes, Limited. He had been with the company for 52 years.

A presentation has been made to Mr. CHARLES ST. LEGER BRIGHTMAN, cables regional sales manager for the north-east area of W. T. Henley (Telegraph Works) Company, Limited, on the completion of 40 years' service with the company.

Federation of British Rubber and Allied Manufacturers has elected Mr. K. H. JOHSTON, manager of the general products division of the Goodyear Tyre & Rubber Company (Great Britain), Limited, a member of the executive committee.

Mr. A. W. WALLBANK, managing director of the Ionic Plating Company, Limited—the metal finishing division of Guest, Keen & Nettlefolds, Limited, group—has received the Gold Medal award at the American Electroplaters' Society Convention in Los Angeles, for his paper entitled "Barrel Plating with Special Consideration to Protection of Thread Diameters."

Mr. R. P. LAWRENCE, chief accountant of the South-Western Divisional Coal Board, received a monetary gift from the parishioners of Pyle and Maudlam on Friday last. He gave the money back to the two churches to be used for altar dressings. Mr. Lawrence is a financial adviser to the Church in Wales and is moving to another district.

After five months in the United States, Mr. MALCOLM CHURCH, 21-year-old apprentice draughtsman, is now back with the Plessey Company, Limited, Ilford (Essex). The trip was awarded to Mr. Church for his outstanding progress as an apprentice. He spent most of his time in the US gaining practical and administrative experience with the Cummins Engine Company, Columbus, Indiana.

Long service awards were presented last Friday to Mr. LEONARD GREATHEAD, works maintenance engineer of C. T. Skelton & Company, Limited, manufacturers of contractors' tools, of Sheffield, on his retirement after 52 years' service, and to Mr. WILLIAM WARING, foreman of the shearing and stamping section of the small tools department, who has completed over 50 years with the company.

Deputy director of the Atomic Energy Research Establishment at Harwell, DR. F. A. VICK, has been appointed director. DR. R. SPENCE, at present chief chemist, takes over as deputy director. MR. L. GRAINGER, now head of the metallurgy division, has been appointed assistant director, with special responsibilities for applied research. Dr. Vick succeeds SIR BASIL SCHONLAND, who continues as director of the Research Group, of which Harwell is a part.

Newly-elected vice-president of the British Internal Combustion Research Association is Prof. S. J. DAVIES, formerly Professor of Mechanical Engineering at King's College, University of London, and the Dean of the Royal Military College of Science. Mr. F. BLACKITH, technical director of Wellworthy, Limited, piston liner and piston ring specialists, of Lymington (Hants), and Mr. S. J. WOOD, manager of the diesel engine department of W. H. Allen, Sons & Company, Limited, mechanical, hydraulic, and electrical engineers, of Bedford, have been elected to the council of the association.

---

# United Steel's University Scholarship Scheme

WITH the object of maintaining its position in the forefront of scientific research and technical advance, the United Steel Companies, Limited, is to offer up to 10 university scholarships each year, tenable at any university in the UK. Each scholarship will be worth £500 per annum and will be offered to a boy entering a university to take a full-time course leading to an approved degree in science or engineering. A limited number of applications from arts students intending to enter industrial management will also be considered.

Successful candidates will receive industrial experience with the company before going up to university and also undertake vacation work in industry. During these periods of industrial training students will be paid a subsistence allowance. On completion of their degree courses, scholars will have the opportunity of joining the company's graduate training scheme, during which period they will be paid salaries at the current rates for graduate apprentices.

Booklets and application forms are available on request from: University Scholarships, United Steel Companies, Limited, The Mount, Broomhill, Sheffield, 10.

# *Llanelly Steel Sold*

## ISHRA RECEIVES £1,750,000 FROM DUPORT

THE Llanelly Steel Company (1907), Limited, has been sold by the Iron and Steel Holding and Realization Agency to Duport, Limited, for £1,750,000, which represents a loss of nearly £1,500,000 on the agency's accounts. The total book value of ISHRA's investment in Llanelly Steel was £3,240,206. It consisted of £1,080,206, which represented the agency's payment for the share capital of Llanelly Steel, and a £2,160,000 ISHRA loan to the company.

For the last two years Llanelly has made a loss. Before loan interest and tax, the loss for the accounting year ending October 3, 1959, was £53,316 and the loss for the preceding year was £172,273.

The Llanelly Steel Company incurred a loss in four out of the past seven years and during this period profits of £444,584 for the three years 1955 to 1957 are offset by losses of £307,130 in the years 1953 and 1954 together with the last two years.

### Briton Ferry Steel

Duport, which has now acquired the entire issued share capital of Llanelly together with the £2,160,000 ISHRA loan, bought the Briton Ferry Steel Company, Limited, from ISHRA in 1956—the year in which Duport changed from its original name of Vono Industrial Products, Limited, to its present style.

Until then the main interests of the Duport group were in non-ferrous hot die pressings, foundries and electrical gear. Since 1956, when besides Briton Ferry it acquired other companies in the steel industry, its main emphasis has been on steel and mass-production engineering.

Duport now acquires 103,713 5 per cent. cumulative preference shares and 341,251 £1 ordinary shares in Llanelly Steel for which compensation under the 1949 Iron and Steel Act had been £1,072,180. In addition it takes over 10,395 ordinary shares, acquired by way of a distribution in specie from the Bynea Steel Works in May, 1957, and taken into the Agency's books at a value of £8,025.

Book value of the Agency's investment in Llanelly Steel is completed by a nominal £1 consideration for 10,692 preference shares and 49,001 ordinary shares taken over from Richard Thomas & Baldwins, Limited, in July, 1960.

## INDIA INVITES OVERSEA TENDERS FOR LOCOMOTIVES

INDIA'S Railway Board has invited any country to submit tenders for the supply of 40 broad-gauge high-powered diesel locomotives of 2,600 h.p. each. They are required to cope with the heavy increases in traffic expected during the Third Plan period on certain sections where full capacity has already been reached with steam locomotives.

Tenders have also been invited for the supply of 75,000 tons of steel material such as plates, sheets, bars, etc. Other materials which the railways plan to buy abroad include 55,000 wheel sets and about 75,000 roller-bearing axle boxes in connection with the wagon-building programme. The supply of axle boxes would be arranged on the basis of progressive manufacture within the country with Indian collaboration.

## Morgan Crucible Programme of Reorganization

REORGANIZATION of the Morgan Crucible Company, Limited, group of companies, which has been in progress for some 12 years, is nearing completion. As the final stage the Morgan Crucible Company is to become on April 1, 1961, a holding company only and will cease to trade. It will still retain its Battersea address. Four additional wholly-owned subsidiaries—each with its own board of directors—are to be registered and this will mean that the group's home trade will be conducted by 11 subsidiaries and its export trade by 12 oversea subsidiaries and Morganite Exports, Limited, although a few agencies will continue to be controlled by Morganite Resistors, Limited, Jarrow.

From April 1, the present range of products will be manufactured and sold in the UK by three wholly-owned subsidiaries—Morganite Carbon, Limited, Morganite Crucible, Limited, and Morganite Electroheat, Limited. In addition, research will be carried out by Morganite Research & Development, Limited.

## Alcan (East Africa) Drops Plan for Aluminium Plant

PLANS for the establishment of a £1,000,000 aluminium rolling mill at Mombasa have been abandoned by Alcan (East Africa), Limited, the company's managing director, Mr. W. G. L. Murray, said in Nairobi on Tuesday. The decision, he said, was not connected with recent disturbances in Africa.

He had just returned from Montreal, where, he said, the parent company had undertaken a reappraisal of the market potential in East Africa and the economics of large-scale manufacturing and had come to the conclusion that the time had not arrived to embark on a development project of the scope originally envisaged.

CREDIT of $5,500,000 is to be granted by the Export-Import Bank to the two Spanish concerns, Altos Hornos, and Basconia, for the purchase of equipment in the US for the expansion of their steel mill facilities. With the projected new installations, a progressive production of tinplate is planned to reach a total of 100,000 tons a year. This amount, together with the present annual production of 18,000 tons, will cover the requirements of the Spanish market, with a consequent reduction in tinplate imports, which last year totalled some 600,000 tons.

*Appointments*

# New Position for Mr. R. F. Lansdown

CHIEF mechanization engineer of the National Coal Board since January, 1956, Mr. R. F. LANSDOWN has now been appointed director of the board's Central Engineering Establishment at Bretby (Derbyshire).

MR. R. F. LANSDOWN

Set up in 1953, the establishment is part of the board's engineering organization. Its two main functions are the development of new machinery and equipment, and testing, particularly special tests of such equipment as machinery, ropes and new material, and improved methods of routine testing.

Formerly with the Powell Duffryn organization, Mr. Lansdown was appointed roof control and process study engineer in No. 6 Area of the NCB's South-Western Division in May, 1947, and in November of the same year he became divisional pneumatic stowing engineer. Mr. Lansdown was appointed power stowing engineer at the board's national headquarters in 1949; in 1951 his duties were extended to include roof supports and strata control. In March, 1953, he was appointed divisional mechanization engineer in the North-Western Division, and in January, 1955, divisional mechanization engineer in the East Midlands Division. He has occupied the post of chief mechanization engineer at national headquarters during a period of great expansion in the power-loading of coal.

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Mr. H. P. FROGGATT has been appointed works manager of Thomas Staniforth & Company, Limited, tool manufacturers, of Sheffield.

Mr. S. H. OLIVER has been appointed manager of the purchasing department of Castrol, Limited, in succession to the late Mr. A. J. Stafford.

Mr. P. McA. MARTIN, general manager of the Sprotborough Foundry of John Fowler & Company (Leeds), Limited, has been appointed a local director.

The traction division of Associated Electrical Industries, Limited, announces the appointments of Mr. J. H. CANSDALE as sales manager, Mr. J. C. WAY as deputy sales manager, and Mr. J. ROSTRON as assistant sales manager.

Mr. M. A. CLIFTON has joined the outside sales staff of the alloys division of Union Carbide, Limited, as a representative in the southern area. He will be based on the head office in London.

Mr. CHARLES GORDON PICKETT has been appointed chief civil engineer of the new civil engineering contracts section of the Thyssen Shaft Sinking Company, Limited, at New Malden (Surrey).

Mr. JAMES LIPSCOMBE has joined the Sheffield firm of steel stockholders, Thomas Millington & Company, Limited, as full-time London representative. He is specializing in alloy tool and die steels.

Mr. H. B. T. WILDE has been appointed chairman of Smith's Stamping Works (Coventry), Limited, in place of the late Mr. S. Bramhall. Mr. H. F. W. Perry and Mr. H. M. H. Fox have been appointed joint managing directors and Mr. W. N. Smith has joined the board. Mr. G. Warriner has joined the board of the subsidiary, Smith-Clayton Forge, Limited.

Mr. H. SHAW has been appointed central workshops manager in the No. 1 (Worksop) Area of the North Eastern Divisional Coal Board. From 1957 to 1960 Mr. Shaw was specialist engineer at No. 3 Area central workshops and prior to his new appointment was workshops superintendent in No. 3 Area. Other appointments are:—Mr. C. TOFT as manager of New Monckton 1, 2 & 6 Colliery in No. 4 (Carlton) Area; Mr. G. B. BOUSTEAD as manager of Frickley Colliery in No. 4 (Carlton) Area; and Mr. J. DEZELAK as manager of Howroyd Colliery in No. 6 (North Barnsley) Area.

Mr. R. A. S. LOMAX, whose appointment is announced as chairman of the Council of Ironfoundry Associations' Training Committee, is a director of Ashwell & Nesbit, Limited, Leicester. He is a member of the Engineering Advisory Committee of the Leicester College of Technology. Mr. Lomax is chairman of the Activities Committee of the Shaftesbury Boys' Club, Leicester, and is this year's president of the Leicester Association of Engineers. In his new appointment Mr. Lomax succeeds Mr. Kenneth N. Davis, who has been chairman of the Council's Training Committee for several years.

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# Shipbuilders' Director Resigns

MR. NORMAN EASTON, a director and secretary of Alexander Stephen & Sons, Limited, shipbuilders, of Linthouse, Glasgow, has resigned. He will be succeeded as secretary by Mr. H. L. Massey. Mr. Easton was the author of an article on shipbuilding in The Times which stirred up much controversy in the industry in December, and he was severely criticized by the Shipbuilding Conference and the Shipbuilding Employers' Federation.

The essence of Mr. Easton's charges in his article was of a "glaring failure" in the leadership of British shipbuilding since the war. He accused the top management of being out of contact with the men, and his analysis of what was wrong won a good deal of support from the younger men in the industry's management.

Mr. Easton, an accountant by training, has been secretary of Alexander Stephen for the past 13 years and a director for six.

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# MINERS' SECRETARY TO SIT ON TUC GENERAL COUNCIL

MR. WILL PAYNTER, the general secretary of the National Union of Mineworkers, has been returned unopposed to a seat on the General Council of the Trades Union Congress, and becomes the first Communist to serve on the TUC for more than 10 years. This became clear on Monday when the nominations for next year's council were published.

Mr. Paynter's is one of the three names submitted for three seats in the mining and quarrying section, so that there will be no contest. His predecessor at the NUM, Mr. Arthur Horner—once Britain's leading industrial Communist—repeatedly tried to be elected to the council, but without success.

# EUROPEAN COAL OUTLOOK

## Continuing Surplus is Forecast for 1960

CONTINUED surplus of coal during 1960 in the European Coal and Steel Community and in Britain is forecast in the annual report of the Council of Association between the United Kingdom and the High Authority of the Community, published recently. The report states that as a result of the National Coal Board's Revised Plan for Coal, Britain will not in the foreseeable future be an importer of coal, but "with competitive prices and the assurance that export markets will have a continuity of supply, it is the UK's intention to achieve a progressive expansion of exports."

The Community has also suffered a fall in demand and has reduced exports. "At the end of 1959," states the report, "the demand for coal was tending to rise again, and it is estimated that internal consumption will be much the same in 1960 as in the previous year. In the Community it might be slightly higher.

"But coal will continue in surplus in the Community, and short-time working seems likely to continue in 1960, since there is no room for further stocking at the mines. Similarly in the UK, there is a tendency to a continuing coal surplus, but as a result of substantial cuts in production the National Coal Board expects a modest fall in pithead stocks."

### The Next 15 Years

In the Community, pithead stocks had risen by the end of 1959 to 31,200,000 tons, with, in addition, 8,600,000 tons of hard coke. In Britain, stocks had risen to 36,200,000 tons, with 2,700,000 tons of gas coke and 5,400,000 tons of oven coke.

The council considered long-term forecasts for coal. It was estimated that requirements of primary energy would increase over the next 15 years both in the Community countries and in the UK, as a result of the rapid expansion predicted for their economies. The increase would be covered mainly by oil, natural gas, and nuclear energy. Demand for coal was likely to remain at about its present level—around 200,000,000 tons for the UK and 250,000,000 tons for the Community—with its increased use by power stations and coke ovens being roughly sufficient to balance the reduction in consumption by other users.

Both sides of the council stressed the importance of measures to improve the efficiency of coal production and to make coal increasingly attractive to consumers, and arrangements for promoting the exchange of information on these subjects were approved.

The European Court of Justice in Luxembourg last week annulled certain rulings made by the ECSC High Authority in 1958 with regard to special rail rates granted by the German Federal Railway for mineral fuels to the advantage of the west German steel industry. Appellants were eight French steel producers. The Court also annulled at the request of Holland and Italy a ruling made by the Authority with regard to the publication of road transport rates for coal and steel within the ECSC area.

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THE SIX BELLS COLLIERY Disaster Fund had reached a total of £60,051 by Wednesday night.

## Drive to Recruit 7,500 Miners for Lancs and Welsh Pits

AFTER a break of two years, the North Western Divisional Coal Board opened a new adult recruiting drive last weekend with a press advertisement campaign throughout Lancashire. A total of 7,500 men may be needed in Lancashire and North Wales before the end of next year.

Seven local pits are scheduled for closure during the period of this recruitment drive, but this is offset by the fact that about 3,000 men have already left mines in the division this year. The existence of such labour wastage makes the absorption of miners from closed pits comparatively easy, and during the next three years new pits at Agecroft and Parkside will probably need between 4,000 and 5,000 men.

Recruiting will be aimed most of all at ex-miners. There is evidence that many good coal-face men who left the industry when surplus capacity began to appear, would like to return to mining. For two years this has not been possible.

Another reason why a recruitment effort is called for now was suggested by a spokesman of the divisional board: to raise morale within the industry. It is hoped that the slogan "Lancashire pits want men!" will deter any men who had themselves considered leaving, and convince them that "there is a future in coal mining."

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## *Miners Criticize One-hour Cut in Working Week*

DELEGATES to the Yorkshire Area Council of the National Union of Mineworkers expressed disappointment last week at the decision to reduce miners' working hours by only one hour a week. The council, meeting at Barnsley, discussed the one-hour reduction awarded recently by the National Reference Tribunal. The tribunal refused the NUM's claim for a seven-hour day.

Mr. Fred Collinridge, general secretary of the Yorkshire Area, said after the meeting: "Delegates feel they have been let down badly on account of all their efforts when the country was badly in need of coal." The question of miners' working hours would be raised again at a national conference of the NUM, he said.

The meeting decided to hold a ballot on August 29-31 to elect a new president for the Yorkshire Area. The two remaining candidates are Mr. Sam Bullough, Area vice-president, and Mr. Jock Kane.

*Orders Placed*

# Colvilles Places Big Order with Davy-United

TWO new cold rolling mills for the Gartcosh Works (Lanarkshire) of Colvilles, Limited, are to be provided by Davy-United Engineering Company, Limited, Sheffield. The contract is valued at £1,500,000.

The mills, each able to roll strip between 28 in. and 62 in. wide, in coils, weighing up to no less than 61,000 lb., will process strip from the hot strip mill now being built for Colvilles by Davy-United.

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TWO ELECTRICALLY DRIVEN pneumatic grain elevators for the King George Dock, Hull, have been ordered from Spencer (Melksham), Limited, Melksham (Wilts), by the British Transport Commission.

IRAQ PETROLEUM COMPANY has placed an order for electrodialytic desalting plant, to be used in the Kirkuk oil fields, with William Boby & Company, Limited, water treatment engineers, of Rickmansworth (Herts). The contract is worth £4,200.

FOLLOWING its demonstration at the textile machinery exhibition in Milan last October, a complete 20,000-spindle textile plant has been ordered by Russia. It forms part of a £1,750,000 contract placed with Prince-Smith & Stells, Limited, Keighley (Yorks), in association with Platts, Limited, Oldham.

OXYGEN CUTTING MACHINERY for supply to a number of American companies has been ordered by the Linde Company division of the Union Carbide Corporation, of the US, from Hancock & Company (Engineers), Limited, Croydon (Surrey)—one of the G. D. Peters & Company, Limited, group of companies. The order is worth about £30,000.

ORDER WORTH £200,000 has been placed with Honeywell Controls, Limited, Greenford (Middx), covering instrumentation for a Russian chemical works. The £2,000,000 plant is being built by Vickers-Armstrongs (Engineers), Limited, to the design of Zimmer's, chemical process engineers, of Frankfurt, and will be used in the manufacture of nylon.

SIX STEAM-RAISING BOILERS are to be supplied and erected by Redheugh de Poray Boilers, Limited, Gateshead, to HM Prison Commission. Each of the boilers will evaporate 4,500 to 5,000 lb. of water an hour. De Poray boilers are also to be installed in the Rochdale factory of N. Corah (St. Margaret), Limited, and in two vessels under construction for the Port Line at the Belfast shipyards of Harland & Wolff, Limited.

PROCESS PLANT to treat ammonia synthesis gas, for Tokai Ryuan KKK, of Japan, is to be designed and engineered by PG Engineering, Limited, a member of the Power-Gas Corporation, Limited, group. The plant is designed to deal with about 500.000 cub. ft. of synthesis gas an hour and consists of a PG high-pressure carbon monoxide conversion unit, using PG manufactured catalyst for high pressure use, followed by hydrogen sulphide and carbon dioxide removal in a two-stage plant employing the Vetrocoke process. The contact is valued at approximately £300,000.

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TIBET'S FIRST STEELWORKS is to be built near Lhasa, it is announced by the Communist Chinese authorities. A start on the construction of the plant, intended to be the core of a heavy industrial complex, was made last month.

# *Atlas Copco's New Appointments*

FIVE new appointments have recently been made by Atlas Copco (Great Britain), Limited, compressed air equipment specialists, of Hemel Hempstead (Herts). Formerly Atlas Copco representative in Scotland, Mr. A. Hayes is now the company's chief sales engineer for mining products in the UK. Before joining the company in 1956 Mr. Hayes was with Hugh Wood & Company, Limited, Padley & Venables, Limited, and J. S. Rollin & Company, Limited.

Newly appointed manager of Atlas Copco's mining division is Mr. W. T. Jones, who has been manager of the Northern United Colliery, Cinderford (Glos), for the past three and a half years. Mr. Jones, who has been connected with the coal-mining industry for 30 years, started work at the coal face and later was appointed undermanager of Eastern United Colliery where he was awarded the BEM for his part in rescue operations at the colliery.

Mr. R. Marshall, who until recently was a technical representative in Scotland for Eimco (Gt. Britain), Limited, now occupies a similar position wth Atlas Copco, but for the whole of the UK. He joined the National Coal Board in 1949 as a tunnelling engineer for the Central East Area, Scottish Divisional Coal Board.

Mr, Ralph Norén has been appointed manager for stationary compressor sales, after nine years with the parent company in Stockholm, and Mr. T. M. Horn, who, until his retirement at the end of last year, was manager of the company's Leeds branch, is maintaining his contact with Atlas Copco in an advisory capacity.

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# *Electric Steelmakers' Guild*

NEW president of the Electric Steelmakers' Guild is Mr. William H. Everard (Edgar Allen & Company, Limited). Mr. William Keen (Jessop-Saville, Limited) is vice-president.

The objects of the guild are to promote progress in the manufacture of steel for commercial purposes in electric melting furnaces and to encourage free discussion and exchange of information of mutual interest to members. Meetings, which are held three times each year, are quite informal, and no records of technical discussions are made or published, members being encouraged to discuss freely their own and other members' problems. Membership is limited to executives who are regularly employed directly in the manufacture of electric furnace steel for commercial purposes.

Secretary-treasurer of the guild is Mr. Richard S. Howes, Steel, Peech & Tozer branch of the United Steel Companies, Limited, The Ickles, Rotherham.

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COUNCIL OF THE SENATE, Cambridge, has recommended the establishment in the university of a Spencer Fund, the income of which—following upon the gift of £2,000 by Mrs. Barman in memory of her father, Dr. L. J. Spencer, FRS, formerly Keeper of Minerals at the British Natural History Museum—will be used to cover travelling expenses of undergraduates and research students of the Department of Minerology and Petrology when working in the field.

# Pay Warning to Unions

## PRICE RISE FEAR BY STEEL GROUP CHAIRMAN

SHARP warning to trade unions about the new round of pay demands facing industry was given by Mr. W. H. Higginbotham, chairman of Edgar Allen & Company, Limited, the Sheffield steelmakers and engineers, who declared at the company's annual meeting: "It must be understood that wage increases and shorter working hours, uncompensated by greater man and plant hour efficiency, must increase production costs. Thereby our export trade, economic stability, and standard of living may be adversely affected."

Mr. Higginbotham went on: "Industry must fulfil its responsibilities to society, if it is to retain such freedom as is left to it. Organized labour must recognize that democratic institutions such as trade unions—whose activities and privileged positions are at present so anomalous—must have competent elected leadership.

"Their members must be prepared to accept reasonable disciplines necessary to give effect to the leadership in discharge of their social responsibilities. The pursuit of their own personal or sectional interests, without regard to those of others, is no longer tolerable."

### Improved Plant

There was impending, said Mr. Higginbotham, a new round of demands for wage increases and a fairer share of allegedly disproportionately increased industrial profits. These demands were based on an improvement in the national "productivity index" but this, expressed as output per man employed, ignored the great contribution made by progressive capital investment and the inescapable fact that process plant might have greater influence on output than that of the labour which attended it.

"These claims will almost certainly be supported by the usual militant speeches, by threats of—and actual—stoppages of work, enforcement of restrictive practices, and by artificially created labour shortages—all impairing stability and confidence."

Referring to taxation, Mr. Higginbotham said: "Our taxation system, exorbitant in its demands, is complicated to the point of mystery, costly, directly and indirectly, in its administration, and rivalling in its ingenuity the methods of medieval barons.

"There is urgent need for long promised simplification and reform," he said.

## HEPWORTH IRON RAISES DIVIDEND

DIVIDEND of 7½ per cent. for the year to March 31, 1960, is being paid by the Hepworth Iron Company, Limited, manufacturers of drain pipes and clayware underground cable conduits, of Sheffield, against a forecast of 6¼ per cent. announced when the company was made public last September. It is also proposed to capitalize £150,000 in a one-for-four scrip issue.

Group profit increased from £150,089 to £385,782, and after tax of £167,000 (£65,399) the net profit is up from £84,690 to £218,782. After deducting £36,758 profits of subsidiaries prior to acquisition and £1,405 minority interests, the balance attributable to the holding company is £180,619 (£81,240).

## Rise in South Wales Iron Imports

AGGREGATE of traffic passing through the South Wales ports in the four weeks ended July 17 amounted to 1,592,024 tons, an increase of 321,000 tons on the corresponding period of last year. Imports of iron ore increased by 156,000 tons to 480,995 tons and those of iron and steel goods (including scrap) rose by 37,000 tons to 46,892 tons. Pitwood and mining timber imports also showed a rise of 5,000 tons to 18,858 tons.

In the export section an increase of 3,000 tons of tinplate brought the total to 36,980 tons. Shipments of coal, coke, and patent fuel in the four weeks were 16,000 tons down on 1959 at 179,128 tons and over the year these shipments show a drop of 64,748 tons.

## *US Crude Steel Production*

THE United States Department of Commerce announces that it expects a crude steel production of between 49,000,000 and 51,000,000 short tons in the second half of the current year in the United States. This represents a use of only 67 per cent. of capacity, as against an average of 82 per cent. capacity use in the first six months of 1960, when some 60,700,000 tons were produced.

The estimated 1960 total from these figures, of about 111,000,000 tons, is considerably lower than both the estimate made at the start of the year of 130,000,000 tons and the revised estimate issued later of 12,000,000 tons. Thus, the 1960 production will not reach that of the record year 1955, when 117,000,000 tons were produced.

## Lowest Bid for Australian Rail Contract

LOWEST tender for the first major work in the £23,200,000 reconstruction of 700 miles of railway from Mount Isa to Townsville in north east Queensland has been submitted by an international group of companies, including Davis Construction, Limited, of England. The group, which tendered £1,833,000 for the first section of 242 miles between Richmond and Duchess, is headed by Hornibrooks, Limited, of Queensland, and includes, besides the British company, Kaiser Construction, of the USA, and Fletcher Construction, Limited, of New Zealand.

The next lowest bid was made by Utah Construction with £1,862,000. The tenders will have to be examined and the lowest need not necessarily be accepted.

# Mr. Longden New Chairman of West Midlands Coal Board

SUCCESSOR to Mr. E. H. Browne as chairman of the West Midlands Divisional Coal Board is Mr. H. A. Longden, at present director-general of production of the National Coal Board. Mr. Browne's appointment as a deputy-chairman of the NCB was announced recently.

MR. H. A. LONGDEN

Mr. Longden, who gave a paper on "The Economic and Technical Implications of the Revised Plan for Coal" at the annual conference of the National Association of Colliery Managers at Southport in June, was president of the Institution of Mining Engineers in 1958 and has been a member of the council of the institution since 1945.

Mr. Longden began his mining career in 1930 with Glass Houghton & Pontefract Collieries, Ltimited, Castleford, the owners of Glass Houghton and Prince of Wales collieries. From 1935 to 1940 he was agent and assistant general manager of the Stanton Ironworks Company, Limited, Nottingham, the former owners of Silverhill Nos. 1 and 2, Teversal, Pleasley, and Bilsthorpe collieries, and from 1940 to 1947 a mining general manager to Briggs' Collieries, Limited, Normanton, in charge of Syndale, Peckfield and Ledston Luck collieries. In 1940 he joined the board of the Blackwell Colliery Company, Limited, and in 1941 he became a director of Briggs Collieries, Limited, and of the New Hucknall Colliery Company, Limited.

He remained with Briggs Collieries until nationalization, when he was appointed Area general manager, No. 8 (Castleford) Area, of the North-Eastern Division, which includes the majority of the pits with which he had formerly been associated. He was appointed production director for the North-Eastern Division in July, 1948. Seven years later he was appointed director-general of production at national headquarters.

# GEC Engineering Group

REORGANIZATION of its representation at its branches in Great Britain under five area chief engineers is announced by the engineering group of the General Electric Company, Limited.

The area chief engineers are as follow:—

LONDON, EASTERN, AND SOUTHERN ENGLAND.—Mr. E. W. Molesworth, Magnet House, Kingsway, W.C.2.

SCOTLAND.—Mr. J. R. Mercer, Magnet House, Waterloo Street, Glasgow.

YORKSHIRE AND THE NORTH-EAST.—Mr. V. F. Ellison, Magnet House, Gallowgate, Newcastle-upon-Tyne.

NORTH-WESTERN AND NORTH WALES.—Mr. O. S. Chalmers, Magnet House, Victoria Bridge, Manchester.

MIDLANDS AND SOUTH WALES.—Mr. W. R. Greves, Magnet House, Newhall Street, Birmingham.

*Coalfield News*

# Midlands Pit Changes Over to Automation

MODERNIZATION of the underground transport system at Hamstead Colliery (Staffs) was completed this week and will be ready for operation when the 600 miners at the pit return to work on Monday. The installation of a 3¼-mile long conveyor belt from the coal face to the pit bottom has eliminated the work of 50 underground haulage men.

Having travelled on the conveyor to the pit bottom, the coal is loaded automatically and hauled to the top of the 650-ft. deep shaft to the surface, where it is automatically conveyed to the washing and screening plant. Four men on each shift, two at the surface and two at the pit bottom, will now do the work which required more than 100 before the £1,000,000 modernization plan began.

There is no risk of redundancy. A spokesman said that jobs could be found immediately for 200 underground men at the colliery. "The 50 men freed from haulage work will be trained gradually for face work on a special training face," he said. "We are hoping productivity at the pit will rise from 19 cwt. per manshift to about 29 cwt. per manshift."

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IN THE FINAL of the No. 4 Area of the North-Eastern Divisional Coal Board's bowls tournament on Saturday, Mr. Cyril Carr, of Houghton Main Colliery, beat Mr. William White, of Grimethorpe Colliery, by 21 points to 18.

STRIKE at Wombwell Main Colliery (Yorks) stopped production on Wednesday morning of last week. The men had a grievance over allowances for certain face workers, but the afternoon shift went down and by evening the pit was working normally.

THE EFFECT of holding the annual miners' rally on a Saturday was described as "disastrous" in a protest by the Rotherham Chamber of Trade to Rotherham Corporation. The chamber claims that the traffic congestion caused by 20,000 miners affected traders' deliveries.

SIXTH ANNUAL Miners' Welfare Festival at Mansfield was opened by Mr. Rex Ringham, chairman of the East Midlands Divisional Coal Board, on Saturday. Among the visitors to the festival were 28 young French miners who were guests of the Coal Industry Social Welfare Organization.

STRIKE which started at Allerton Bywater Colliery (Yorks) on Tuesday of last week continued over the holiday period and no further meeting has been arranged until August 14. The strike was caused by disagreement with underground officials as to who should fill up a quantity of spare coal.

ANOTHER of the seven men burned last week in the explosion at Cardowen Colliery, Stepps (Lanarkshire) has died. This brings the number of deaths to four. As a mark of respect for their colleagues who died in the mishap, the 800 miners at the pit stayed home on Tuesday—the day on which they were to have returned to work.

FURTHER SHORT LEASE of life has been granted to the Jubilee pit at Sandwell Colliery (Staffs), which was due to close last month. A spokesman for the NCB said that the closing date has not been finally agreed upon, but it is now likely to be in September. The 210 men still employed at the mine at the closing date are to be transferred to the nearby Hampstead Colliery.

# WINDING GEAR ELECTRIFICATION

## Good Progress in the North-East

BIG steps towards the electrification of winding gear at all but one of the 11 collieries in the No. 3 (Rotherham) Area of the North-Eastern Divisional Coal Board have recently been undertaken. It is expected that, by 1962, with the exception of Aldwarke Colliery, every pit will have electric winding facilities. The programme will have a considerable impact on the elimination of atmospheric pollution as well as increasing efficiency at the collieries.

During the holiday period last week the steam winder at Elsecar Main No. 1 shaft was dismantled and scrapped. It has been replaced by a 400-h.p. electric winder. To complete the changeover for the resumption of work on Tuesday, round-the-clock working had to be carried out and careful planning between the NCB and the manufacturers was necessary. At Silverwood Colliery a new winding house and electric winding engine of 2,250 h.p. was installed at the West Pit shaft earlier this year and the changeover from the steam winder took place last week. This necessitated the dismantling of the greater part of the existing winding house and engine.

At Denaby Main No. 2 shaft a new electric winder of 1,250 h.p. will shortly be put into service, and at the No. 1 shaft the steam engine is to be replaced with a small 100-h.p. winder.

Developments planned for 1961 and 1962 include a 1,000-h.p. electric winding engine at Elsecar No. 2 shaft, a 2,900-h.p. winder at Barnburgh Colliery's No. 5 shaft, a 2,000-h.p. winder at Cortonwood No. 1 shaft, and a 1,100-h.p. winding engine at Cortonwood No. 2 shaft. Excavation work for the Cortonwood No. 1 and Barnburgh No. 5 engine houses is now in progress.

## *VOEST Takeover of Austrian Coal-mining Concern Mooted*

AUSTRIAN Minister Herr Bock has stated that the Steinkohlenwerk Grünbach coal-mining concern may be taken over by the State-owned VOEST company. The other leading Austrian coal-mining company, Alpine-Montan Gesellschaft, which has recently closed one of its brown coal mines in Styria, is to carry through an internal reorganization plan.

The ministerial committee empowered by the Austrian Federal Government to draw up a plan for the reorganization of the Austrian coal industry is to discuss the possible payment of pensions to redundant miners who have not yet reached pensionable age, but are too old to be retrained in another branch of the industry.

STEEL PRODUCTION in Canada is continuing the firmer tendency which has prevailed since the low level was established in June. Production advanced slightly again in the week ended July 22 and mills operated at 85.1 per cent. of capacity compared with 84.4 per cent. the week before. However, operations were below the 87.7 per cent. level of the corresponding week last year.

## *"Ample Willingness" for More Anglo-Soviet Trade*

IMPORTANCE of individual contacts between representatives of UK manufacturers and their opposite numbers in the Soviet trade organization was stressed on Monday by Mr. Harley Drayton, who headed the recent delegation to Moscow from the Institute of Directors. Speaking on the Associated-Rediffusion programme "This Week," Mr. Drayton said the Russians were prepared to enter into 10- and 15-year trading agreements with individual UK manufacturers.

There was ample willingness on the Russian side to buy British turbines, generators, and machine tools, and "in the foreseeable future" they might be large buyers of consumer goods. The Soviet market of 206,000,000 people and a largely industrialized economy was not one which we could afford to ignore, Mr. Drayton pointed out.

On their part, the Russians were anxious to export iron ore, manganese, and oil to Britain, "but there must be more contact between men on the same level," he concluded.

## MINE MACHINERY HIT BY GHANA BOYCOTT

SOUTH AFRICA will lose about £3,000,000 annually through Ghana's boycott of goods from the Union, which took effect on Monday. Mine machinery manufacturing will be one of the industries hit by the boycott, which was described by Col. R. Jones, director of the South African Exporters' Association, as the "most serious blow the country has suffered as a result of boycotts."

South Africa's exports to Ghana were far more varied than to other countries boycotting the Union, while much capital had also been invested by South Africans to build up trade.

## German Mining Students to Tour Warwickshire

PARTY of 10 German mining students is to visit the Warwickshire coalfield from August 9 to 17 as the guests of the National Coal Board under the international student exchange scheme. The boys will be based in Nuneaton from where they will visit Baddesley, Birch Coppice, Coventry, Kingsbury, Daw Mill, and Arley collieries, as well as Lea Hall Colliery in the Cannock Chase Area, and Hem Heath and Wolstanton collieries in the North Staffordshire Area.

The students will also see the Warwickshire Area central workshops and the open-cast mining site at Cannock Chase.

# Sir Willis Jackson Returns to University

PRESIDENT of the Institution of Electrical Engineers, Sir Willis Jackson, FRS, is to return to academic life as Professor of Electrical Engineering at the Imperial College of Science and Technology, University of London. He resigned from the Chair seven years ago to join Associated Electrical Industries, Limited, as director of research and education.

SIR WILLIS JACKSON

A former apprentice of the old Metropolitan-Vickers Electrical Company, Limited, now Associated Electrical Industries (Manchester), Limited, Sir Willis, in the past seven years, has exercised a great influence in the field of research and education, not only in the electrical industry, but also in the wider sphere of technological education.

At present Sir Willis is a member of the University Grants Committee, the National Council for Technological Awards, the Research Council of the Department of Scientific and Industrial Research, the National Council for the Supply and Training of Teachers, the Committee on the Organization and Control of Government Research Expenditure, and the Federation of British Industries Research Committee.

## RISE IN INDUSTRIAL OUTPUT

INDUSTRIAL production in the second quarter of this year was about 2 per cent. more than in the first quarter and 9 per cent. higher than a year ago, according to figures released last week by the Treasury. The index for June is given provisionally as 122-123, compared with the May level of 121, and the previous peak of 122 in April.

The sectors in which there was still a rising tendency in June can only roughly be identified at present, but the substantial and growing order-books in the engineering industries suggest that output in this sector has continued to expand. Associated with this is the near-capacity level of working in the steel industry, and the machine tool makers also now have much more work on their hands.

## *Obituary*

The death has occurred of Mr. WALTER BURNETT, a lecturer in engineering at Sheffield University for 33 years.

The death has occurred of Mr. SYDNEY CHARLES HALL, chief buyer for Rists Wires & Cables, Limited, Newcastle (Staffs). He was 55 and had been associated with the company since 1931.

The death has occurred of Mr. FRANK SHAW, secretary of the Skinner Tool Manufacturing Company, Limited, Sheffield, at the age of 63. He was previously with Moses Eadon & Sons, Limited, W. K. & C. Peace, Limited, and Thos. R. Ellin (Footprint Works), Limited.

## *In Parliament*

### Pneumoconiosis Panel Englarged

DETAILS of arrangements to increase the size of the Sheffield Pneumoconiosis Panel so that the Pneumoconiosis Medical Board can deal more rapidly with claimants of industrial disablement benefit were given by MR. W. M. F. VANE, Joint Parliamentary Secretary to the Ministry of Pensions and National Insurance.

MR. VANE told MR. WILLIAM WARBEY (Lab.) in a written answer that two more full-time doctors were being added to the panel, one of whom had already taken up duty. New and larger premises were also being built for the panel, which should be ready for occupation by the end of the year.

In a reply to a further question, MR. VANE said that the number of claimants from the East Midlands area was not large enough to justify the establishment of a separate pneumoconiosis medical board at Nottingham.

### Six Bells Inquiry

ASKED by the REV. LLWELYN WILLIAMS (Lab.) when he expected the inquiry into the Six Bells Colliery explosion to be finished, MR. RICHARD WOOD, the Minister of Power, said the preliminary investigations were being carried out urgently in order that the inquiry could open as soon as possible.

The report of the Chief Inspector of Mines would be laid before Parliament as required by the Mines and Quarries Act, 1954.

## *Average Pay of Manual Workers Over £14 a Week*

AVERAGE earnings of manual workers in the manufacturing industries during the last pay week of April, 1960, were £14 16s. 4d., the highest ever recorded, and 127 per cent. more than they were in April, 1947. In industry in general, the corresponding figure was £14 2s. 1d., again the highest on record and 128 per cent. above the 1947 level. This is shown by the provisional statistics for the half-yearly survey issued by the Ministry of Labour last week.

During the six months since the last survey, the pay of men in manufacturing has risen by 4.3 per cent., and that of men in industry as a whole by 4.1 per cent. On average, men worked 48 hours a week—30 minutes fewer than in October. The drop in the manufacturing industries was more marked, being 47.4 hours instead of 48.2. Average earnings of full-time women workers were £7 5s. a week (2.9 per cent. more than in October), and £7 5s. 2d. in the manufacturing industries.

## Engineering Display in Canada

THE Board of Trade and the Birmingham Engineering Centre are jointly organizing a British engineering exhibit at the National Industrial Production Show of Canada to be held in Toronto from May 8 to 12, 1961. This exhibition, one of the leading specialist shows in Canada, is held every two years and receives widespread support from Canadian, American, and European firms.

In 1959 the joint effort by the Board of Trade and the Engineering Centre at Toronto for the first time was regarded as a successful venture by the 39 British firms who took part, and it has been decided to repeat the effort.

# SUMMER COAL STOCKING

## "Industrial Consumer should be Offered Incentive"

THE advantages, both to the National Coal Board and to the consumers, of stocking coal during the summer are stressed by the Industrial Coal Consumers' Council in its report for the year ended June 30, published on Wednesday. The council takes the view that some financial incentive should be offered. The Domestic Consumers' Council, in its report for the same period, recommends that traders be required to state the NCB grouping of the coals they sell.

The industrial council notes that since the end of 1959 there has been a better balance between production and demand. In the first four months of 1960 total sales were up by nearly 2,000,000 tons on 1959, and the Coal Board's undistributed stocks fell by over 2,500,000 tons, whereas a year earlier they rose by 4,000,000 tons.

The NCB has had no difficulty in providing all the coal required by industrial consumers, but during the winter there were some difficulties on the railways in getting the coal to where it was wanted, which leads the council to think that a balance should be maintained at all times between road, rail, and coastwise shipping.

### Strain on Transport

The difficulties experienced in moving coal during the winter lent further point to the need for summer stocking by industrial consumers. Those who take the bulk of their supplies in the winter put an added strain on the transport and distribution systems. The council regards this matter as of the utmost importance and feels that consumers should be offered some financial incentive to take their supplies evenly throughout the year. They would support any worthwhile scheme designed to bring this about.

The council considers at least part of the answer to the growing competition from oil is for coal to be made more attractive, in the widest sense, to industrial consumers. They welcome the steps taken by the board to improve the consistency of its products, its information and advisory services to industry, and its publicity.

The domestic council states that although the National Coal Board produced more than enough coal in total to meet all demands, there were the usual difficulties during the winter in getting it quickly to all those who wanted it. It is up to consumers, if they want to have solid fuel to burn when it is cold, to do their bit towards easing these distribution problems, and the council urges that all who can should take advantage of the lower summer prices and stock up before the winter.

The council suggests that an answer to the difficulties experienced by some consumers in ordering less than 5 cwt. at a time and in getting fuel delivered to the upper floors of blocks of flats may lie in making more readily available packaged fuels which consumers could fetch for themselves.

Allegations about the prices charged by local traders for different qualities of house coal were examined and the council was satisfied that the greater part of the trade, both large merchants and small, were doing their best to provide good service at reasonable prices, but that some traders were taking advantage of the domestic consumer. The council has therefore recommended to the Minister that all traders should be required to state the NCB grouping of the different coals they sell, in such form as to bring any misrepresentation of the grouping within the scope of the Merchandise Marks Acts.

The council considers it "grossly unfair" of some traders to expect consumers to pay for excessive moisture in coke as if it were coke. In view of its increasing importance as a smokeless fuel, they recommend that more thought be given to finding some practicable means of moving and storing coke under cover.

In London, on Wednesday, Mr. Douglas Cory-Wright, deputy chairman of the Industrial Coal Consumers' Council, said there was a feeling that the railways might fail in coal distribution during the coming winter, largely because of staffing difficulties. He emphasized that everything would be done to prevent a breakdown of supplies of industrial and domestic coal. One solution would be to provide more road transport.

## Council Chooses Coal Heating System

BEFORE installing a new heating system in the police headquarters, Dudley Town Council appointed a sub-committee to investigate the cost of heating by oil, electricity, and coal. Oil, it was told, would cost £11,800 in capital charges and £1,400 a year to operate; electricity—block storage heating—£9,800 to instal and £1,585 a year to run, and coal £12,000 to instal but only £1,100 a year to operate.

The council decided on the coal-fired system despite opposition on the grounds that the police station was in a smokeless zone. The chairman told the council that the engineers said the system and the fuel used would meet all the requirements under the Act.

## IMPROVED SAFETY IN SOUTH-EAST DURHAM PITS

PRESENTING safety awards to miners at Blackhall Colliery (Co. Durham), Mr. L. C. Timms, general manager of the South-East Durham Area, Durham Division of the NCB, said that following a safety campaign the accident rate in pits in the Area had been reduced. In the first half of this year there had been 12 fatal accidents, compared with 16 in the corresponding period of 1959, while the number of accidents involving more than three days incapacity had fallen from 187.28 per 100,000 manshifts to 164.09.

Everyone, said Mr. Timms, was becoming more safety conscious and he hoped that the reduced accident rate would be maintained.

*Non-ferrous Metals*

# Copper Prices Steady on Congo Events

ALTHOUGH consumer interest in the London copper market is rather apathetic, prices have been steady due to the unsettled conditions in the Congo and in the Rhodesias. There is, too, the point that observers are sceptical about reports that operations at Union Minière are back to normal.

The situation in Africa has had its repercussions on the other side of the Atlantic, where the US authorities have now relaxed their former regulation requiring that exporters of copper should give the name of the ultimate user before receiving an export licence. This will go a long way to preventing a squeeze developing in this country, or on the Continent, should supplies be interrupted from Africa.

In the US the market continues quiet and the price structure is unchanged at 33 cents a pound, applicable to both producers and custom smelters. Elsewhere it is of interest to note that there has been no further development on the discussions between Anaconda representatives and the Chuqicamata mineworkers on a new labour contract. The recent increases in copper stocks in LME warehouses slowed down last week and they were only higher by 80 tons to 5,354 tons.

Tin has gone quiet in London and in New York, although it is still firm in Singapore, where consistently better US demand has pushed the price up to its highest level for over three years. The feature of the London market is the strength of three months' metal, which has resulted in the appearance of a contango and a higher premium on high purity Straits tin. The outlook in London is still good. At the end of last week tin stocks in LME warehouses totalled 9,641 tons, a rise of 300 tons on the week. In the US the market is quiet with the price fluctuating narrowly below $1.05 cents a pound.

Lead has shown a small improvement in London, where the price is now over £71 a ton, and in New York, where the spot price is unchanged at 12 cents a pound. Zinc, however, is still a weak market on both sides of the Atlantic. In the US the East St. Louis spot price is unchanged at 13 cents a pound.

Official metal prices in London yesterday (Thursday) were:—COPPER, Standard: Prompt £251 10s., forward £252. TIN, Standard: Prompt £812, forward £813. LEAD: Prompt £70 17s. 6d., forward, £71 12s. 6d. ZINC: Prompt £89 10s., forward £89 5s.

## £10,500,000 Iron-ore Plan for Norway

SCHEME for the exploitation of extensive iron-ore deposits in the Dunderland Valley, in northern Norway, has been submitted to the Ministry of Industry by the State-owned mining concern, Rana Gruber A/S, and will probably be discussed in the Norwegian Parliament this autumn. The plan provides for some Kr. 210.000.000 (£10.500.000) to be invested in opening up the mines and building a concentrating plant for the ore.

Mining operations would start in 1966 and annual output would reach 750.000 tons of concentrate a year later, giving work to some 500 men. The nearby State-owned steelworks at Mo i Rana would probably use all the concentrate produced.

# Law Cases

### £2,250 Damages Award Overturned

DAMAGES award of £2,250 made by a jury to an Ayrshire miner's widow, Mrs. Agnes Johnston McCluskie, in 1958 was overturned by Lord Guthrie, to whom it had been referred after an appeal. Mrs. McCluskie sued the National Coal Board for £5,000 after the death of her husband, Bernard McCluskie, in an accident at Barony No. 2 Pit, Auchinleck. The NCB appealed to the Second Division of the Court of Session, which ordered that the action be retried.

At the appeal Lord Justice-Clerk, Lord Thompson, giving judgment, recalled that the jury at the jury trial had added certain observations to its verdict for the pursuer which had been said either to convert the verdict into one for the NCB or to nullify it by ambiguity. The jury had then reconsidered the matter and brought in a verdict for Mrs. McCluskie without repeating its observations.

Lord Guthrie, in giving his judgment, said that the evidence adduced by Mrs. McCluskie was very unsatisfactory. Her chief witness, David Allardyce (31) who was with McCluskie when he was killed in a roof fall, was prosecuted for perjury at Ayr Sheriff Court and sentenced to three months' imprisonment. Lord Guthrie thought that a fair inference of the evidence was that the fall was not only unexpected but could not have been foreseen and guarded against. He therefore held that Mrs. McCluskie had failed to prove a breach of the statutory regulations, or that any such breach caused the accident.

### £2,500 Damages for Boy

AT Leeds Assizes Mr. Justice Streatfeild awarded ten-year-old George O'Neill, son of a colliery attendant, Mr. William O'Neill (32), £2,500 damages against the National Coal Board for injuries received in an accident on the coal line near his home at Bentley (Yorks) in 1957.

The action was heard at the last Sheffield Assizes and Mr. Justice Streatfeild, in a reserved judgment, said the boy was not a trespasser. The Coal Board should have anticipated that children would be tempted by the fun of running after slow-moving trains.

He said the boy's left leg had been badly injured, and he was more or less cut off from ordinary games and would have to seek employment which did not involve much activity.

### Fell Asleep Down Pit

FINE of £15 was imposed at Kilmarnock Sheriff Court on William Reilly (23), who admitted falling asleep underground at Mauchline Colliery (Ayrshire) during working hours—an offence under the Mines and Quarries Act, 1954.

Reilly, who was employed to carry wood props to the coal face, was said to have slept on despite the attempts of workers to waken him. He eventually awoke when a shot-firer shouted at him, and explained his tiredness by saying that he had been wakened on two successive nights by his child.

AT LEEDS ASSIZES Mr. Francis Cawthorne, miner, was awarded £500 damages with costs against the National Coal Board for injuries received in an underground accident at Shawcross Colliery, Dewsbury (Yorks), in 1956. It was stated that he was struck by a fall of roof, as a result of which he could now do only light work.

MR. P. J. C. BOVILL, B.Sc., J.P.

## MR. P. J. C. BOVILL, B.Sc., J.P.

MASTER CUTLER for 1959/60, Mr. P. J. C. Bovill has been managing director of Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield, since 1956. Born in Cornwall, he is, however, a Yorkshireman through long association.

Educated at Cheltenham College and Sheffield University, where he graduated (B.Sc.) in fuel technology, Mr. Bovill joined Newton, Chambers in 1922 as assistant manager of a subsidiary, Thorncliffe Coal Distillation, Limited, becoming works and sales manager of the tar distillation works six years later. In 1933, he was appointed joint manager of Coke Oven Products, Limited, Newton Chambers being at that time one of the partners. He left that company in 1939 to join Rother Vale Collieries branch of the United Steel Companies, Limited, as commercial manager of the by-products department. Mr. Bovill returned to Newton, Chambers in 1942 as a local director and general manager of the chemicals branch. In 1951 he was appointed vice-chairman of the board of local directors and in 1954 assistant managing director in charge of the chemicals division. He joined the full board the following year.

Mr. Bovill is a director of Ransomes & Rapier, Limited, Ipswich, and of Wellman Smith Owen Engineering Corporation, Limited, Darlaston, and is chairman of NCK Rapier Sales Company, Limited, London. He is a member of the South Yorkshire board of the Eagle Star Insurance Company, Limited, and of the board of Governors of Sheffield Trustee Savings Bank.

His live interest in social work includes chairmanship of Sheffield No. 1 Hospital Management Committee. He is president of the Thorncliffe Social and Recreational Association, which co-ordinates many activities of Newton, Chambers employees. Mr. Bovill is a Justice of the Peace for the Hallamshire Petty Sessional Division of the West Riding of Yorkshire and a member of the Court of Governors of Sheffield University and of the council of Sheffield Chamber of Commerce.

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# Dust and Fume Emission from IRON AND STEEL WORKS

## INTENSIVE DRIVE TO REDUCE ATMOSPHERIC POLLUTION

*The various annual reports under the Alkali, etc., Works Regulations Act, 1906, and subsequent Orders, 1906-1958, provide a useful record of attempts to reduce dust and fume emission from iron and steel works. Recent developments, including oxygen in steelmaking, have greatly intensified the fume problem and the report* for 1959 contains an extensive review of the present position and the more immediate future. The section on iron and steel works is appended in an abridged form.*

### ENGLAND AND WALES

THE number of iron and steel works registered in England and Wales is 206, the size varying from small rotary furnaces and 1-ton electric-arc furnaces at one end of the scale to mammoth integrated works with annual productions of up to 3,000,000 tons of steel at the other.

#### General Problem of Dust and Fumes

The inspectorate, we are told, is under no illusions as to the magnitude of the tasks facing it. It is now beginning to be able to assess the various problems, and with some processes even to see the broad lines along which eventual success is possible. In some directions it is not only to be able to make definite recommendations but to have them accepted and fume plant installed or ordered.

At national level there have been further consultations with the British Iron and Steel Federation, the British Steel Founders' Association, and the Joint Iron Council. At district level there have been investigations into many problems and numerous consultations between inspectors and works managements in attempts to apply the broad decisions reached at national level to actual site conditions—not always an easy task. Co-operation with industry both at national and district levels is good, and especially with the larger works which are often ready to meet the inspectorate half-way.

In view of the many issues involved, and they are many, for great and fundamental changes are likely to occur in the industry, and also of the considerable cost of dust and fume plant, certain works, mainly interested in projects involving usage of large amounts of oxygen, and consequently involving copious emission of brown fume, have asked for a period of grace to allow them to carry out large-scale trials and experiments. Such reasonable and proper request has been granted in every instance, the district inspectors keeping in touch with the trials. In some instances the trials have already been sufficient to indicate the type of fume plant likely to be needed. In others further time is clearly needed. It would be unwise to proceed too fast. There is still much to be learned by trial and error. Nonetheless, some major decisions must be made by the industry and by the inspectorate, and many of them in 1960, concerning processes involving large-scale use of oxygen, whether in pre-refining, or in the newer pneumatic processes or applied to the more orthodox techniques.

* Ninety-sixth Annual Report of "Alkali etc., Works," by the Chief Inspectors, 1959. (Stationery Office, price 4d.)

#### Preparation of Iron Ores and Concentrates

Problems connected with the handling, calcining, drying, and sintering of iron ores before feeding to the blast furnaces have received special attention and the inspectors are now reasonably clear as to the broad lines of requirements. Ores vary greatly in their chemical composition and physical characteristics. Home ores are low in iron content (average perhaps 27 per cent.) and relatively high in sulphur and slag-forming constituents. Some are wet, clayey, and difficult to handle. Foreign ores and concentrates may contain from 50 to 60 per cent. of iron, with corresponding variations in gangue and slag-forming materials. Some are dry and dusty: indeed, save in really wet weather they are mostly free-running.

Generally speaking, the reception and handling of ores need not normally create a nuisance except when dealing with very dry and dusty materials in adverse weather. Nor should the dust deposition be widespread. Wagon tipping should be effected under cover. Crane drivers should be carefully instructed in the proper use of grabs. When it is necessary to drop ores from a height the use of, *e.g.*, flexible shutes should be considered. Stocks of ore fines should be under cover or otherwise protected from wind whipping. Conveyors should be enclosed or at least provided with side sheets: provision should be made to facilitate the spraying of dusty ores with water if desired.

The object of calcination is to increase the iron content of an ore by drying and by decomposition of carbonates and other volatile matter. In clamp calcination, a bed of coal some 12 in. thick is laid

down on a suitable piece of land and a mixture of raw ironstone with about 2.5 per cent. by weight of slack coal is piled on top at the natural angle of repose. The clamp may be as long as the site permits and the height about half its width. The coal under the clamp is ignited and combustion gradually spreads and moves forward. It may go on for 14 to 16 weeks after which another 10 to 11 weeks are needed for cooling. When the clamp is laid down the ore is usually damp, but after calcination it is bone dry and reclamation is quite a dusty business. Ore to the extent of about 1,000,000 tons a year is still treated. Clamps are usually in isolated areas. With increased use of sintering, the practice seems to be dying out. Calcination in vertical cylinders is also practised, but on a smaller scale.

Ore drying is also a dusty business, and where it is practised adequate dust-arrestment plant is necessary. Ore dryers are usually of the rotating drum type and fired with blast-furnace gas. As a provisional target, which may need emendation later, the inspectorate is suggesting that the mass rate of dust emission to air from these drying processes should not exceed 0.1 per cent. of the material fed to the dryer. Transfer points on conveying systems and screens for drying fines should be enclosed and draughted to dust-arrestment plant. Crushing and screening plants can give rise to appreciable dust emission and appropriate dust-arrestment plant should be provided.

### Ore Sintering and Air Pollution

There are major air pollution hazards arising from the modern technique of sintering. About 2,000,000 tons of ore were sintered in 1947, compared with a current annual rate of some 10,000,000 tons, and the practice is extending. Physically, sintering converts fine dust into hard agglomerates; chemically it results in concentration of the iron content and the elimination of some of the impurities, which would otherwise be dealt with in the blast furnace. Thus sintering not only effects all the purposes of calcination, but goes very much further. Correct preparation of the charge results in improved "drive" and a higher rate of production in the blast furnace. Careful preparation of the charge to the blast furnace, including effective sintering, is therefore a matter of major importance. Good sinter can be made from most types of ore.

Gases from sinter strands should be de-dusted and discharged to air at a height determined by the sulphur dioxide content. Chimneys of up to 300 ft. are being required. Hot sinter is discharged at the end of the strand remote from the feed end to breakers, screens, and coolers. There is considerable dust emission from breakers and screens which can be dealt with by high-efficiency cyclones or by electrical precipitation. Quenching of fine sinter and pugging of other recovered dusts are further sources of dust emission needing attention. Sintering, therefore, gives rise to appreciable air pollution problems. Tentatively the inspectorate is suggesting that dust emissions from the strand gases and from breakers and screens be each below 0.1 per cent. of the sinter made. It will be appreciated that all these standards must, in the present imperfect state of our knowledge, be tentative and that they may need modification as further information becomes available. Nonetheless, they serve as a target.

A number of sinter plants have either been commissioned recently or are under construction or are contemplated. The inspectorate's requirements have either been incorporated, are being incorporated or will be incorporated. Sintering being a specialized form of calcination, certain strand gases may contain small amounts of fluorine compounds. Such emission is not considered as one of the major problems, but it is one which will be measured and its importance assessed in due course.

### Blast-furnace Dust and Gas

Concerning blast furnaces, last year's report stated that the industry had been informed of and had readily accepted the department's view that the deliberate or regular bleeding of excess, dirty blast-furnace gas when on full wind could not be allowed to continue. It has now been agreed that at integrated works where this is not usually a major matter, gas being normally used for the heating of coke ovens, sinter, boilers, soaking pits, and the like, any gas which has deliberately to be bled to air shall contain less than 0.2 gr. of dust/cu. ft. This will require the gas to be passed through, for example, an efficient washing tower before bleeding. It is preferred that integrated works bleed only the fully cleaned gas. This is indeed done at certain works, but it remains a counsel of perfection and perhaps too exacting for present general, national application.

The main difficulty concerns the non-integrated and usually much smaller works, largely the so-called "merchant" plants, where there is no regular use to which the whole of the blast-furnace gas can be put. The agreement here is that the dust content of any gas deliberately bled to air be reduced to 0.5 gr./cu. ft. In practice this means that some form of washing tower will be needed. In all cases bleeding must be from a sufficiently high stack and with precautions to deal with spray. A reasonable period of grace will be given to allow the industry to conform.

The involuntary bleeding of dirty gas following sudden descent of the furnace burden presents a difficult problem. Few gas-cleaning plants can take the whole of the sudden build-up of pressure and some must escape by way of the bleeders on the furnace. The incidence of such slipping is substantially less than it was and by improved operating conditions and careful preparation of the burden it must be kept to the minimum.

### Fume from Oxygen-fed Steel Furnaces

A few years ago steel production could conveniently be discussed under the headings:—Bessemer converters, open-hearth furnaces, and electric-arc furnaces. The use of large quantities of oxygen, a technique still in its infancy in this country, has cut across this simple division.

Pneumatic processes whereby molten metal from the blast furnace will be treated with large amounts of oxygen either by pre-refining in the ladle, followed by a more conventional later refining, or by direct one-stage conversion to steel, are likely to be common. Already there are full-scale units in operation with fume dealt with by electrical precipitation and by bag-filtration, and elsewhere trials are taking place to decide which type of pneumatic process to adopt and which method of fume treatment to adapt to the emission expected.

The Bessemer converter, which still presents a most intractable problem, largely because of the problem of containment of the emission, has, by the use of oxygen, enhanced its already spectacular emission. The effect of introducing steam at the same time may have had some good effect on the appearance, but the striking beneficial effects reported oversea have not so far been recorded in this country. The tropenas, which is in essence a small side-blown Bessemer, presents somewhat similar problems but proportionately smaller. Experiments with fume plant have been in hand for some little time, but no firm conclusions have yet been reached.

About 80 per cent. of the steel production of England and Wales is still by the open-hearth process. There are some 320 to 330 furnaces, of which about one-fifth are below 60 tons capacity with the remainder ranging up to 360 tons. Further measurements on the dust burden of the waste gases show that this can vary from 0.05 to 0.5 gr./cu. ft. After careful consideration it has been agreed with the industry that as a short-term provisional policy recourse be had to high chimneys, the precise height being determined by the amount of sulphur dioxide involved and by local factors. Where oxygen application occurs the inspectorate has informed the industry that it is prepared to allow full-scale trials in such application to be made at open-hearth furnaces not fitted with fume-cleaning plant, although certain limiting conditions might be made, *e.g.*, in relation to wind direction.

The matter is one for mutual agreement between the district inspector and the works management concerned, and local authorities are informed of the arrangement. This dispensation applies only to experiments, and regular or appreciable use of oxygen will need the installation of high-efficiency gas-cleaning plant. Such trials are proceeding at a few works with the position still fluid at the end of the year.

### Fluorine in Furnace Gases

Where fluorspar is used in the open-hearth technique there is the virtual certainty that some of the combined fluorine will be emitted with the waste gases, but in what form is uncertain. At the time of tentative experiments some years ago and long before the process was registrable under the Alkali Act, fluorine was believed to be evolved in the form of gaseous hydrogen fluoride. Belief is growing that some of the fluorine evolved from industrial processes, and in some cases most of it, may be present as particulate matter.

Re-examination of the problem began in 1959 and, as a preliminary, 34 washings of waste flue gases were taken at eight open-hearth plants and examined by the Government chemist. The analyses confirmed earlier findings that the concentration of fluorine in the waste gases is maximal (up to 0.2 gr./cu. ft.) soon after addition of fluorspar, following which it falls away rapidly. These figures are reasonably reassuring, but the investigation will continue. It is of some interest to note that full works scale trials are taking place with all or part of the fluorspar replaced by a fluorine-free material.

### Fume from Electric Furnaces

There are some 140 to 150 electric-arc furnaces in England and Wales, with capacities ranging from 1 to 80 tons and perhaps with larger units in prospect. Most of the existing units are below 25 tons capacity. Possibly the least difficult of the steel problems is that of the smaller electric-arc furnaces without usage of oxygen. Many of these are without fume-collection systems, but an increasing number of works consider that, in the interests of melting shop staff alone, dust extraction systems should be fitted. The present tentative opinion is that in the majority of cases it will suffice to discharge this collected air by a chimney of sufficient height to allow adequate dispersal of fume. With new installations intended to be operated without oxygen lancing, sufficient space should be left for installation of cleaning plant in case it becomes necessary at some future date.

Where there is usage of oxygen, and it is believed that this will eventually be the case with the vast majority of plants, all new units must be fitted with best practicable means of gas cleaning. Possibilities are electrical precipitation, bag-filtration or high-efficiency washers, *e.g.*, of the Venturi or disintegrator type. With existing units the appreciable and regular application of oxygen will require the eventual installation of one of the previously mentioned types of cleaning plant.

A still unresolved point arises on the standard of attainment in the design of such cleaning plant. There is insufficient information for one to be definite. Tentatively, it is felt that the target may well be a reduction in dust to below 0.05 gr./cu. ft., but it is certainly too early to quote a standard whether it be in terms of optical obscuration or grains per cu. ft. The great variation in size of electric-arc furnaces is such that considerable freedom must be allowed to the district inspector. It might be unrealistic to apply the same standards at both ends of the scale. Moreover, there may be a great number of cases between almost negligible oxygen usage and heavy lancing.

Use of oxygen for deseaming presents a similar brown fume problem. At some works this has now been satisfactorily dealt with by electrical precipitation and this means is being installed at others.

The melting of iron and steel in rotary and air furnaces calls for no major comment. Once fur-

naces have reached a sufficient temperature, operations should be reasonably smokeless. There is difficulty in the initial stages. The devising of the necessary measures to keep smoke emission to a practicable minimum is a matter for individual inspectors and works' managements.

A much more serious and difficult matter is that of emissions from hot-blast cupolas. This has been carefully investigated and has been discussed at some length with a technical panel of the Joint Iron Council. It soon became apparent that hot-blast cupola operation was not a mere melting process for the supply of metal for foundry processes, but must more properly be seen as a metallurgical operation of some precision. The matter was one of urgency.

At the time of the public inquiry leading to the Order of 1958, hot-blast cupolas were few and of the recuperative type. The externally fired type was not generally known. The hot-blast technique is now extending, and a number of projected plants or conversions of cold-blast cupolas were being held up pending a decision on the means to be taken to deal with the waste gases. The potentialities for interfering with local amenities—to put it no higher—were more serious than at first supposed. The larger units may have a throughput of 25 ton/hr., comparable with the smaller blast furnaces, and there may be two or more on the same site.

It was appreciated on both sides that the relative newness and limited use of hot-blast had restricted opportunities for investigation and there were still many uncertainties. Agreement has been reached with the industry on the broad lines of a provisional "best practical means" for dealing with emissions.

The measures agreed, which have been designed to cover both externally fired and recuperative plants, require the arrestment of particulate matter and the discharge of fume at a height determined by the scale of operations. They are provisional in the sense that they are designed to cover an interim period of experience and research which may well lead to the evolution of improved means including the arrestment of fume. Meanwhile, they are a reasonable solution and should enable industry to proceed with its policy of development.

There have, of course, been many complaints against emissions from iron and steel works, states the report, most of them justified. All that inspectors can do is to admit responsibility and to say that they are searching for an answer to these difficult problems, but that there can be no speedy solution.

## SCOTLAND

Although in Scotland there were 31 premises with certificates of registration for the production of iron and steel, the major pollution problem lay in some seven works where iron and steel are produced.

Advances in blast-furnace technology have called to an increasing extent for more uniform sizing of the raw ore fed into furnaces On the other hand, a variety of iron ores are imported into Scotland from a wide area, some arriving warm from the tropics and some just thawed from the Arctic. The call for greater uniformity in size in ores varying widely in their physical state has led to substantial increase in recent years in the practice of sintering.

By its very nature this is a dusty process. From the time the first plant was started in Scotland some 20 years ago there have been complaints about dust which became well known to the inspectorate through the local authority asking advice in dealing with the problem. Improvements were made from time to time, but grounds for complaint still remain.

It is known that the designs of some contemporary plants erected in England and Wales have features which do much to abate dust emission. Unfortunately, the improvements are fundamental modifications in the layout of sinter plants and they cannot be incorporated in existing plants. The owners of dusty sinter plants, however, have undertaken to make an extensive addition to dust-collection equipment, particularly at points of dust emission in the conveying and screening of the sinter. Although a dust-collection system which is added to existing plant is not usually so effective as one which is an integral part of the original design a very material reduction in dust emission is expected.

The bulk of the iron production in Scotland is made in modern blast furnaces which appear to cause very little air pollution in relation to their pollution potential. All points which are now considered good practice in controlling air pollution seem to have been carried out for some time by the owners of these blast furnaces.

Almost all the iron is converted to steel in open-hearth furnaces. There are no Bessemer furnaces. Open-hearth furnaces are generally fired with oil or producer gas and there is no real smoke problem. The flue gases are usually taken to high chimneys through waste-heat boilers which tend to catch grit. The bulk of the visible discharge from the chimneys is a fume of finely divided iron oxide particles which present an arrestment problem of great technical difficulty and expense to overcome. Apart from brief and not very frequent periods in the cycle operation of an open-hearth furnace. the density of the fume is not heavy and the palliative of dispersal through high chimneys is being sought where it is not already adopted.

Meanwhile, the industry is faced with deciding whether it adopts bulk usage of oxygen in steelmaking. The injection of oxygen into molten steel greatly expedites conversion, but there are many other operational factors to take into account in reaching a decision. One of these factors is a vastly increased emission of iron oxide fume. It has been made clear to the industry that if bulk oxygen usage is adopted, means of abating the intensified iron oxide fume emission will have to be provided.

In steelfoundries, which vary greatly in size,

(*Contd. on p.* 294)

# THE SHAKING LADLE IN OPERATION at the MANNESMANN-MEER WORKS at München-Gladbach

*In connection with the abridged article published in our issue of February 26 last, the following abstracts from an article by S. Tunder in La Métallurgie et la Construction Mécanique (May, 1960) relate to an experimental shaking ladle in operation at München-Gladbach. Further information on the shaking ladle can be found in an article in Jernkontorets Annaler (1959, No. 8), a full English translation of which is available on application to the Metallurgical Editor.*

AT München-Gladbach desulphurization has been carried out by placing the shaking ladle in front of the fore-hearth of a cupola furnace, but in order to avoid the drop in temperature associated with the passage of the melt through the fore-hearth, the metal was passed through a spout directly from the cupola itself into the shaking ladle. Thus the temperature of the melt after treatment in the shaking ladle was not less than that of a melt coming from the fore-hearth.

One to 2 per cent. commercial quality powdered lime is added to the melt in the shaking ladle, and through the improved contact between the lime and the melt by the agitation of the bath, the sulphur content of the melt is eliminated with the formation of CaS. The oxygen liberated is combined with the carbon of the coke breeze which is also added to form CO, and escapes through the mouth of the ladle, where it forms $CO_2$ by combustion. This combustion produces a slight over-pressure inside the ladle, which is used to advantage to counteract the penetration of oxygen from the air into the ladle. Practice has shown that during a shaking period of only 10 min. the degree of desulphurization exceeds 90 per cent. The working temperature was 1,400 to 1,450 deg. C.

### Low-silica Lime Content

With an initial sulphur content of 0.15 to 0.2 per cent. the final content was always 0.01 per cent., while the temperature drop in a 3-tonne ladle was only about 40 deg. C. The best results were obtained with lime with the lowest possible silica content and a low combustion loss, which at the same time prevents excessively violent reactions. A small addition of soda prevents the CaS, which forms as friable balls, from adhering to the lining of the ladle. After pouring and slagging off, there is no residue in the ladle.

Experiments were also conducted at München-Gladbach with cupola charges of 50 per cent. steel scrap and 50 per cent. ingot mould scrap, which produced melts with an average of 2.9 to 3.1 per cent. C and 0.13 to 0.2 per cent. S. After treatment in the shaking ladle with 1 to 2 per cent. limestone and 1 per cent. coke breeze the melt had a content of 3.7 to 3.9 per cent. C and 0.01 to 0.02 per cent. S.

The experiments also showed that after treatment in the shaking ladle the proportion of free carbon in the total carbon content had increased, with a

FIG. 1.—ADDITION OF LIME AND COKE BREEZE TO THE LADLE.

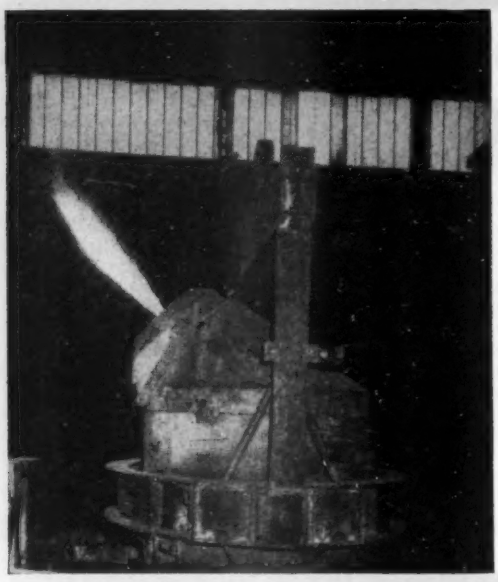

FIG. 2.—THE SHORT FLAME EMERGING FROM THE LADLE AT THE HEIGHT OF THE REACTION.

corresponding decrease in the combined carbon, producing a cast iron of desirable texture in which the graphite was precipitated in a matrix of ferrite, accompanied by a drop in the hardness of the cast iron. Such melts are very suitable for casting ingot moulds, with a silicon content of about 1.3 per cent.

The experiments also indicate that the same combination of cupola furnace and shaking ladle could, with advantage, be used for the production of spheroidal graphite cast iron using smaller additions of magnesium, and also for the production of ferritic, blackheart, malleable iron.

The shaking ladle in operation at München-Gladbach is closed by a cover before shaking is commenced. This cover can be seen in Fig. 1 behind the workman, who is making an addition of lime and coke breeze to the ladle. During treatment the reaction between the solid and liquid components is marked by the flame seen in Fig. 2 which emerges due to the overpressure within the ladle. This flame disappears after a few minutes, and the remainder of the process takes place without visible reactions.

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SVENSKA FLÄKTFABRIKEN, Stockholm, which has developed an electro-filter method for purifying blast-furnace gases, has received an order for three such units from Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V., Ijmuiden. They are intended for purifying 240,000 cu. m. of gas/hr. to a degree of purification of 99.7 per cent. The order is reported to be worth about £206,000.

# *Book Review*

**Roll Pass Design.** Publications Department, United Steel Companies, Limited, P.O. Box 64, The Mount, Broomhill, Sheffield 10. 280 pp. £3, post free.

FOR those acquainted with the earlier books relating to steelmaking and processing published by the United Steel Companies, Limited, it will be sufficient to say that this book maintains the high standard of the series with regard to content and presentation. It will be useful to those desiring a general understanding of the subject and invaluable to the serious student of rolling.

The opening chapter gives clear definitions of rolled products and follows with a more extensive historical account of the use of rolls for metalworking than is usually found in treatises on rolling. The stranger to the subject thus has his interest aroused and will read the second chapter, which describes the characteristics of hot-rolling, with equal interest and profit. By this time, in the space of about 40 pages, he will have covered the elements of rolling theory and practice. From then on his handling of the book may well be more selective, but he will find a study of the next chapter on roll materials, roll strength load, and torque not too difficult and certainly necessary for a good appreciation of the subject.

The remaining six chapters deal with specific fields—the rolling of flat products; blooms, slabs, and billets; bars and rods; angle sections; rails; beams and channels. To the newcomer these may be more detailed than he requires, but he will be able to select the salient aspects of each chapter because of the systematic treatment of subject matter; for instance, each chapter opens with a definition of its field.

The serious student will appreciate the historical and general approach of the three introductory chapters and find the theoretical and practice treatment of roll pass design in the remaining chapters sufficiently comprehensive until he wishes to specialize on a particular field. Even so, he will find the work of specialists has been frequently drawn upon in preparing this book and that many useful references are given. The book is also well illustrated, including several large diagrams that fold out clear of the pages and a 14-in. by 28-in. copy of the Ekelund spread nomogram tucked into a pocket on the back cover.

## DUST AND FUME EMISSION

(*Contd. from p. 292*)

electric-arc furnaces are commonly found. In normal operation very little iron oxide fume arises and, except in the case of the largest furnaces or in the case of a furnace very near houses, it is doubtful whether their emissions are of any consequence. On the other hand, the practice is becoming common of injecting, or lancing, the molten steel with oxygen. For the sake of maintaining good working conditions, exhaust ventilation has had to be provided and the discharge from the exhaust system can be troublesome outside the foundry. The degree of this problem varies very greatly; in small foundries oxygen may be injected for only a few minutes two or three times a day, whereas in larger foundries with larger furnaces the emission may be both considerable in amount and in time.

# Lea Hall Colliery

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## *Maintaining Output in Cannock Chase*

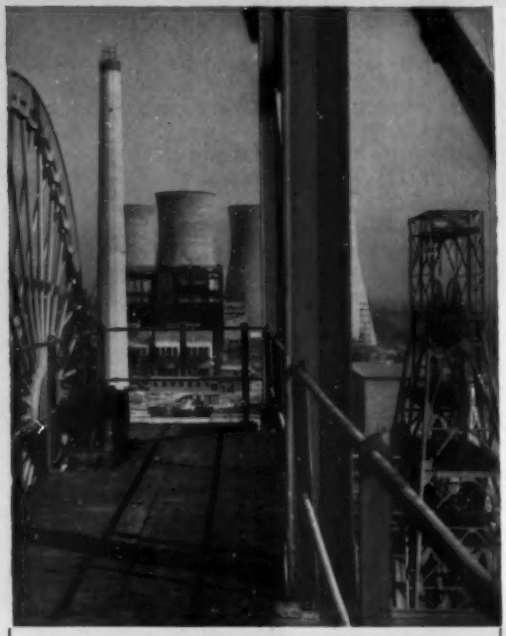

FIG. 1.—LOOKING THROUGH THE HEADFRAME OF NO. 1 SHAFT TOWARDS THE NEW POWER STATION WHERE HALF THE COAL PRODUCED WILL BE CONSUMED.

*Coal production at Lea Hall Colliery, near Rugeley (Staffs), which was started at an inaugural ceremony by Mrs. E. H. Browne, wife of the chairman of the West Midlands Divisional Coal Board, marks a new era in the life of the Cannock Chase coalfield. The proving of a new coalfield, containing reserves of* 148,000,000 *tons, and the subsequent development of the colliery to produce an annual output of* 1,500,000 *tons, have been undertaken entirely by the NCB. Half of the output is earmarked for a new power station nearby. It will be transported by conveyor belt.*

DECLINING reserves are a problem which inevitably faces all mining undertakings, and at the end of the last war the Cannock Chase coalfield, after producing coal for several centuries, faced contraction. Some collieries would be reconstructed for a longer life, but a number would be exhausted within the next 20 years or so, and it was thought that mining operations would have to be scaled down. The most northerly colliery in the coalfield, Brereton, was working the remaining reserves bounded by a large geological disturbance known as the Eastern Boundary Fault.

Mining engineers believed that the geological inferences of the area east of the boundary fault, though uncertain, justified following up, and after a careful appraisal a borehole was put down. This borehole was of crucial importance; it revealed the presence of the full series of Cannock Chase coal seams at workable depths between 700 and 2,000 ft. below the surface. Five more boreholes were then put down and these established the existence of a coalfield big enough to justify a new colliery. To explore the whole area, a total of 32 holes were bored; of these, 14 proved the full sequence of the Coal Measures. The boreholes covered a field of 7,000 acres and involved six and a half miles of boring of which over two miles was diamond cored. Within an area of 4,200 acres there are reserves of coal with a total average thickness of 51 ft., amounting to 148,000,000 tons. Table 1 shows the reserves of coal and the analyses of the seams.

It was decided that a new colliery, to be called Lea Hall (which was the name of the farm on

## Cost of the Project

WHEN the workings have been fully extended, Lea Hall Colliery will have cost about £14,000,000, the main elements being:—

Shaft sinking and equipment, £1,335,000; main tunnelling underground, £4,630,000; underground plant, £2,295,000; coal preparation plant, £1,250,000; other surface plant and structures, £2,546,000.

which the colliery has been sunk) should be established to work the newly proved area. This, with the rebuilding of collieries in the older parts of the coalfield, would give a new lease of life to mining in Cannock Chase.

TABLE 1.—*Workable Reserves at Lea Hall Colliery.*

| Seam. | Total workable tonnage (1,000 tons). | Analytical data (average). | | | |
|---|---|---|---|---|---|
| | | Ash (air dried). | Sulphur (air dried). | Volatile matter | Coal survey Code No. |
| | | Per cent. | Per cent. | Per cent. | |
| Brooch .. | 5,215 | 6 | 2 | 39 | 902 |
| Benches .. | 6,023 | 8 | 2½ | 40 | 902 |
| Eight Feet .. | 7,936 | 5 | 1½ | 35 | 901 |
| Park .. .. | 12,817 | 6 | 1½ | 39 | 902 |
| Heathen .. | 9,652 | 5 | 1 | 38 | 902 |
| Yard .. | 17,638 | 6 | 1½ | 40 | 802 |
| Bass .. .. | 14,802 | 6 | 1½ | 39 | 902 |
| New Mine .. | 15,872 | 7 | 1½ | 39 | 802 |
| Shallow .. | 32,807 | 5 | 1½ | 39 | 802 |
| Deep .. | 25,610 | 4 | 1 | 37 | 802 |
| Total .. | 148,372 | — | — | — | — |

### Structure of the Coalfield

The Lea Hall coalfield is the eastern extension of the Cannock Chase coalfield and lies to the east of the Rugeley shatter belt, which was formerly considered to form the eastern boundary. The new area is roughly in the form of a triangle, with its base running approximately east-west a mile north of Rugeley and its apex some four miles to the south.

Over the whole region the Coal Measures are concealed under heavily watered sandstone of the Trias, which along the Trent Valley are covered by a belt of deep alluviums approximately a mile wide.

The Triassic rocks, varying in thickness from 300 ft. to 700 ft., rest on Coal Measures that dip generally in a northerly direction. Within the area to be worked by the new colliery, the surface of the beds of the Coal Measures is in the form of a broad valley and the shape of this valley determines the upper limits to which each seam can be worked.

The underlying coals rise northwards so that the lower seams incrop against the base of the Trias. From the evidence of the boreholes the coals are not severely disturbed by large faults and the seams lie in a broad syncline with its axis pitching southwards.

Except in the extreme north-east of the field, dips are generally less than 1 in 15.

The most northerly fault, the Carwarden, can be seen at the surface and upthrows the coal to the north by about 150 ft. The Langley fault, some 500 yd. north of the shafts, is a conjectural structure deduced from borehole evidence and also upthrows the coal to the north by about 150 ft. The Redhill Bore Fault has an upthrow to the north of about 150 ft. The most southerly fault truncates the apex of the triangle, throwing the coals down below the reach of the new colliery.

### Difficulties in Siting

The siting of the new shafts did not allow a wide choice. The location had to be fairly central for development of the reserves and railway facilities had to be available. The site finally selected is on the plain of the river Trent, about a mile east of Rugeley. The site was not an easy one, for the water table is only 6 ft. below the surface and alluvium is present up to a depth of 70 ft. Thus all main building, structure, and plant had to be carried on piles.

A greater problem even than providing foundations in the surface alluvium was presented in the sinking of the shafts, because beneath the alluvium there is 640 ft. of water-bearing sandstone and pebble beds. The shafts were required to have a finished inside diameter of 24 ft., and they were to reach a depth of 1,300 ft., from which level output can be maintained without further deepening for at least 60 years.

It was decided to employ the freezing process for the sinking of the shafts and for this purpose 34 holes, 6 in. dia., were bored to a depth of 715 ft. in a circle of 40 ft. round each shaft. Tubes, 5 in. dia. and sealed at the base, were inserted into the holes, which were carefully surveyed by the contractors, the Foraky Boring & Sinking Company, Limited, to ensure no appreciable divergences from verticallity. Within the 5-in. tubes, 1½-in. tubes were then inserted, giving a concentric system of piping, connected to the freezing plant which circulated brine at minus 2 deg. F. From the strata, 25,000,000 BThU of heat were extracted in four months.

Sinking, using the NCB's own labour (Fig. 2), began in February, 1954, and average rates, excluding inset work and low-pressure grouting, were 16.7 yd./month in the frozen section of the upcast and 21 yd./month in the downcast shaft. Sinking operations were carried out in the orthodox manner with hand loading into hoppits using single-rope sinking winders. Lengths of 80 to 100 ft. were excavated and temporary lining effected by corrugated sheets held in position by skeleton rings. On completion of the 100-ft. section of the shaft it was lined with mass concrete of not less than 30 in. thick in the frozen sections of the shafts and not less than 18 in. in the dry sections. Winding

FIG. 2.—THE SHAFT SINKING, USING THE NCB'S OWN LABOUR.

levels at 295 and 401 yd. were established with insets, which took an average of four months to complete.

### Winding Equipment and Transport

In No. 1 shaft there are to be two cage-winding systems, each operated by a 2,100-h.p. winding engine designed by the General Electric Company, Limited. Together they are capable of winding coal at the rate of 600 ton/hr. The No. 2 shaft is to be used for winding men and materials and is fitted with one pair of cages operated by a further 2,100-h.p. electric winder. This engine is provided with a clutch mechanism so that the effective length of the wind can be altered from the upper to the lower horizon as required. Two winding engines for Nos. 1 and 2 shafts are housed in a common winding engine house situated between the 134-ft. A-shaped headgears of steel construction. This arrangement was made possible by the complete separation of the electric control apparatus for each winding engine and by extensive fire-precaution in the dual-winding engine house. The second winding engine for No. 1 shaft is housed in a further engine house on the opposite side of the shaft. Provision has also been made, on the south side of No. 2 shaft, for a fourth winding engine.

The underground workings are laid out on a modified horizon mining principle. The coal, loaded on to conveyors at the coal face, is carried along roadways by belt conveyors, either straight to loading points where it is filled into 3-ton mine cars, or, if it is delivered along a roadway at a level between the main horizons, it passes through 5-ft. dia. spiral chutes down staple shafts, at the bottom of which it is loaded into mine cars. Transport on the main underground roadways will be provided by the English Electric 65-h.p. battery locomotives drawing trains of 30 3-ton mine cars for coal and special cars for men and materials. The haulage tracks are 2 ft. 6 in. gauge.

Mine cars brought to the shaft bottom are marshalled and controlled by mechanical means and propelled into the cages.

FIG. 3.—COAL REACHING THE SURFACE AND ABOUT TO ENTER THE TIPPLER.

The cages are wound to the surface in 58 sec. by the 2,100-h.p. winding engines. On arrival at the surface the full cars are expelled from the cages by compressed-air rams and travel on short mine-car circuits with gravity shunt backs. The cars pass through tipplers (Fig. 3) where the coal is emptied and carried by belt conveyors to the coal preparation plant. Each tippler can take two classes of coal and dirt by the use of a time-controlled chute mechanism.

The coal preparation plant will be ready for use early next year. Until then the small quantity of coal produced will be crushed and stocked for use at the adjacent power station. The plant will be capable of dealing with 600 tons of raw coal per hour. The coal over ½-in. size from the higher grade seams will be treated in a Barvoys dense-medium plant designed and erected by Head Wrightson, Limited. After separation the clean coal will be screened to provide domestic fuels in the larger sizes and industrial doubles and singles in the smaller sizes. The small coal will be extracted and fed into the power station through a blending bunker system together with crushed coal from the industrial seams. At the power station the coal will be pulverized for firing the boilers.

The cleaned coal for rail transport will be loaded into wagons underneath the plant. The wagons are moved by mechanical "mules" operated by remote control. Coal for despatch by road will be carried by conveyor to landsale bunkers.

During the early stages of the development of the colliery the Central Electricity Authority, as it was then called, was contemplating the construction of a power station on the banks of the river Trent in the same area. With the prospect of both schemes materializing together, the National Coal Board and the CEA worked in close consultation.

The result of this consultation is that the power station and the colliery are sited close together and coal will be conveyed direct from the colliery to the power station.

About half the output of the colliery is earmarked for the electricity station. For this purpose all the small coal will be extracted and coal from industrial-type seams will be crushed (Fig. 4) and added to it. Coal can also be brought from other collieries and passed into blending bunkers, which are being provided to give a consistent fuel to the power station. The incoming fuel will thus be able to supplement the supply available from the colliery to the extent required to enable the whole of the power station requirements to be supplied by belt conveyor with minimum handling charges.

Larger sizes of high-grade coal will go to other consumers. Lea Hall is well situated to supply industrial and domestic consumers in the Stafford and Lichfield areas and the industrial centres between Wolverhampton and Birmingham. The colliery is also situated on the main line for London and the south. These coals will be available for use in open fires, for industrial furnaces, and for steam-raising boilers. Coal for these consumers will be loaded for rail or road delivery as required.

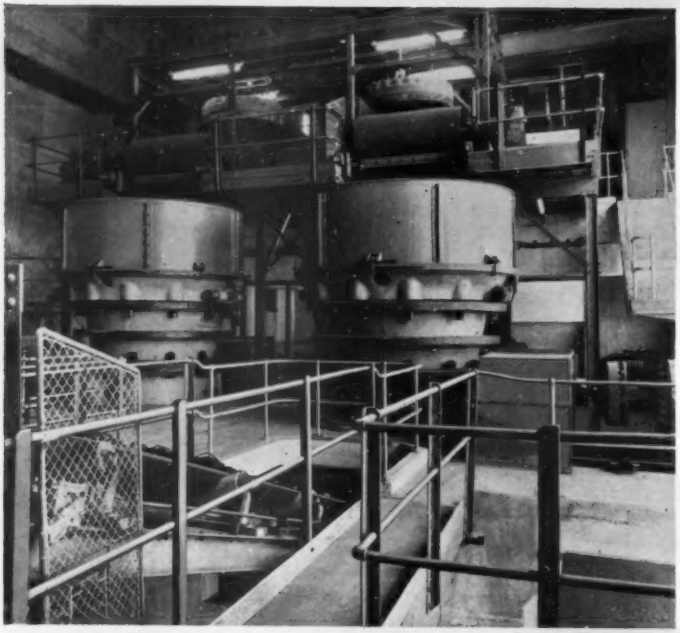

FIG. 4.—INDUSTRIAL COAL IS CRUSHED IN THESE PRIMARY CRUSHERS FOR THE POWER STATION.

### Power and Heat

Today the efficient generation of electricity, by large power stations, has so increased that it is normally more economical for collieries to take power from the national grid supply.

At Lea Hall the proximity of the power station emphasizes this. The incoming supply is at 11,000 V and provision is made for a demand of 15,000 kVA for use at the coal face, on roadways, and on the surface. Coal-fired plant, smokeless because of modern design and mechanical stoking, provides heating for water for the whole of the surface including the pithead baths. This plant will comprise three high-pressure hot-water boilers, each of 9,000,000 BThU/hr. capacity.

Compressed air at 80 lb./sq. in. gauge will be utilized where necessary with 10-in. dia.

compressed-air mains on main pit-bottom roadways, 8 in. dia. on the laterals, and 6-in. mains on the production cross-cuts.

Since the coal seams lie between some 400 to 900 ft. of water-bearing strata it is intended to leave all seams which lie within 200 to 250 ft. of the base of the Triassic deposits. By adopting such a method it is hoped to limit the make of water, but adequate pumping capacity has been provided in the main pumphouse. The pumphouse is located between the shafts at the lower horizon. It is designed to accommodate two 500-gal./min. and two 250-gal./min. Mackley 12-stage and nine-stage pumps, operating against a head of 1,475 ft. The water lodgement will hold 500,000 gal. and is designed to permit one section to be closed down for cleaning out while the other is in operation.

Ventilation of the workings at Lea Hall is provided by two Aerex radial flow fans of equal capacity, capable of passing between 150,000,000 cu. ft./min. at ½ in. w.g. and 535,000 cu. ft./min. at 12.5 in. w.g. One fan is fitted with a fluid coupling and a 2-to-1 reduction gearbox which is capable of meeting the whole range of duties from early development requirements to ultimate through control of the fluid coupling when between 1964 and 1965, the mine reaches its planned annual output of 1,500,000 tons. The second fan is fitted with a gearbox capable of taking a wide range of gear ratios and, in addition, an inlet vane control system.

**Output and Mechanization**

Initial production of output at Lea Hall Colliery will be by mechanized pillar-and-stall mining using gathering-arm loaders. This system of mining has been chosen to provide initial output and at the same time give surface protection to the bed of the river Trent.

As the mine develops, orthodox longwall methods will be applied using modern forms of power loading on a basis of not less than 35 per cent. mechanized output. Lea Hall is planned to produce up to 1,500,000 tons per annum, or 6,250 tons per day saleable. The colliery is expected to provide work for at least 3,000 men and provision can be made to employ a further 1,000 men. Most of this labour will be derived from exhausted collieries to the south of Lea Hall and from recruitment. Face o.m.s. has been planned at 92¼ cwt. saleable, the overall o.m.s. underground is to be 47.9 cwt., and with the surface labour amounting to 348 men, the overall o.m.s. for the colliery will be 43.5 cwt.

The total area at present allocated to the mine is six and a half square miles and to reach the planned output, approximately 23 miles of roadways and 20 staple shafts will have to be driven. Speeds of drivage at present being obtained vary between 25 and 30 yd. per week, utilizing compressed-air drilling and MC3 gathering-arm loaders with Sotim accumulator cars between the loader and the mine car.

Although all mining operations below the surface at Lea Hall Colliery were undertaken by the National Coal Board's own labour, the following consultants and contractors completed the design and erection of specialized plant and equipment:—

Consultant for the surface works was Sir Alexander Gibb & Partners. Winding engines, surface conveyors, coal and dirt crushing plant, coal sampling plant, and battery locomotives and charging equipment were provided by the English Electric Company, Limited. Surface civil engineering work was undertaken by John Laing & Son, Limited, and the freezing of the strata prior to the sinking of the shafts by the Foraky Boring & Shaft Sinking Company, Limited.

The coal preparation plant was designed by Head Wrightson Colliery Engineering, Limited, and the landsale plant by W. J. Jenkins & Company, Limited.

Boiler plant for water heating was provided and erected by Edwin Danks & Company (Oldbury), Limited, and the headframes by the Lilleshall Company, Limited. Airlock and cage equipment was by Gutehoffnungshütte Sterkrade Aktiengesellschaft and the decking and car handling equipment by the Norton-Harty Engineering Company, Limited, and Plowright Bros., Limited.

Ventilating fans were designed and installed by Aerex, Limited. and the main sub-station electrical equipment and underground main switchgear supplied by Associated Electrical Industries, Limited. Piling and foundations work for the temporary winding houses was completed by Holst & Company, Limited, and the embankment for railway connections, etc., by Sir Alfred McAlpine & Son, Limited.

Railway connection and sidings were carried out by Thos. W. Ward, Limited, and the air compressors supplied by Daniel Adamson & Company, Limited. Staple shaft winding engines were provided by John Tinsley, Limited, and the materials transport equipment by W. G. Allen & Sons (Tipton), Limited.

Main underground pumps were designed by E. N. Mackley & Company, while the medium-tension inbye switchgear was supplied by A. Reyrolle & Company, Limited.

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IRON-ORE PRODUCTION in Malaya in 1959 reached the record level of 3,760,684 tons, compared with 2,795,261 tons in 1958. This represents an increase of 34 per cent. Exports last year were 3,722,329 tons, against 2,591,382 tons in 1958.

THE LARGEST diesel-electric shunting locomotive to operate on Swedish railways was recently delivered to TGOJ, the railway company belonging to the Grängesberg group. It is the first unit in a series of five and has been built by Svenska Järnvägsverkstäderna, Falun. The electrical equipment has been supplied by Asea. The locomotive weighs 61 tons, has an engine output of 800 h.p., and a top speed of 50 km./hr. The locomotive is primarily to be used at Oxelösund, the Grängesberg Company's steelmaking centre and ore-shipping port.

# ACCIDENTS AT MINES

## Some Avoidable Instances

BRIEF accounts based on reports of HM Inspectors of Mines draw attention to some of the fatal accidents which might have been avoided during the 13 weeks ended April 2.

On a longwall advancing power-loader face, in a seam where a shale and unconformable sandstone roof is supported by corrugated bars set on hydraulic props, a packer was getting dirt by means of a pick at the edge of a waste when a fall of roof occurred and struck him, causing injuries from which he later died. If long-handled rakes had been provided and used at the time this accident might have been avoided.

At the loader-gate roadhead of a longwall advancing power-loader face where an armoured face conveyor delivers coal on to a scraper-chain stage loader, a faceman was assisting to advance a slide-bar roof support when he inadvertently stepped back on to the moving stage loader and was partially drawn under the gearhead of the face conveyor. He died later from the injuries he received. Provision of additional means for stopping the stage loader from the face side would have obviated the risk of accident.

A fitter was filling loose coal at the corner of a Meco-Moore stable buttock prior to turning the machine when he was struck by a stone which fell from a well-defined, but concealed, slip in the roof. He died later in hospital. The irregular roof had prevented the addition of a link bar, but had a temporary prop been set without delay there would have been no danger.

### Packer Killed by Roof Fall

On a conventional undercut face a packer was knocking out the front prop from under a bar at the waste edge when he was killed by a fall of roof which occurred in the vicinity of a major fault. The accident might not have happened had the withdrawal operation been carried out according to the specified system.

At a surface sidings where empty wagons gravitate down a gradient of 1 in 50, three wagons became stuck near a cross-over due to snow and ice on the track. The leading wagon was uncoupled and a platelayer was pushing on the buffer when the other two wagons ran forward and crushed him, killing him instantly. This accident resulted from a breach of Regulation 13 of the Coal and Other Mines (Sidings) Regulations, 1956, but it might have been avoided had the other two wagons been properly secured before attempting to move the leading one.

A developer withdrawing supports by means of a hammer was buried and killed by a fall of roof which reeled out the prop he was attempting to withdraw and extended over a length where supports had been removed earlier. The roof was of strong blaes, but evidence of induced breaks was indicative of roof weighting which had probably occurred some time before. The accident would have been avoided had a safety device been used as specified in the Support Rules.

### Non-observance of Support Rules

A filler was struck by a fall of roof and killed instantly. There was a space of 7 ft. 5 in. between the last setting of supports and the buttock of coal from which the man was filling. The incident would not have occurred if the Support Rules had been observed.

A wagon lowerer unsuccessfully tried to stop a set of four empty wagons from running into full wagons standing under the screens. After calling to the man who should have controlled the set and failing to get a reply, he went round and found him lying beside a stationary wagon on the adjacent track with fatal injuries consistent with his having been crushed between the stationary and moving wagons. The accident would have been avoided if the stationary wagons had not been left so near the points where the tracks converge, thus reducing the walking space between wagons on adjacent tracks.

At a back-ripping lip passing through faulted ground combined with old goaf there was a cavity above the new steel arch supports, the space between the last new arch, and the lip being partly covered by timbers on two horseheads. A stone which fell from the roof of the cavity missed the horseheads and struck and killed a contractor's mate who was cleaning up preparatory to setting the next arch. The accident might not have happened if the chocking and filling in of the cavity had been continued as at first started so that the roof could have been kept more secure.

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# Film Shows Coke Production at Murton

JOINTLY produced by the Durham Divisional Coal Board and Woodall-Duckham Construction Company, Limited, is a film showing the advances made in coking practice during the last few years. A comparison is made between the production of coke from the beehive ovens of the Victoria coking plant, Whinfield Works, Rowland Gill (Co. Durham), with the production of coke from the Murton coking plant, Murton, in the same county.

The Whinfield beehive oven sequences were shot during the last fortnight of operation before the plant closed down at the end of 1958. The filming of the Murton coking plant took place during 1959 and, for the greater part, during normal operation of the plant.

The film is a 16-mm. colour sound film, single perforated, full width optical sound track, 900 ft. in length with an approximate running time of 25 min. The projection speed is 24 frames/sec.

Introduced by Mr. M. D. Edington, carbonization manager of the Durham Divisional Coal Board, the film was produced and directed by Mr. W. A. Speed, publicity manager of Woodall-Duckham Company, Limited, in conjunction with Turners Film Unit, Newcastle-upon-Tyne. The commentary is given by Kenneth Kendall, the BBC television announcer.

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### Iron and Steel in the North-east

"The iron and steel industry has shown a remarkable recovery throughout the year," it is stated in a review of economic and industrial conditions which accompanies the annual report for 1959-60 of the North East Industrial and Development Association. It adds: "The iron and steel industry, the third important basic industry of the region, has traditionally been linked with shipbuilding, mining, and the railways. As these decline in importance, it will become increasingly necessary for the iron and steel industry of the north-east to continue to adapt itself to new products and new markets if the present prosperity of the industry is to continue."

*PROGRESS REPORT OF ACTIVITIES OF INTERNATIONAL COMMISSION FOR STUDY AND RATIONALIZATION*

# METHODS OF GAS ANALYSIS OF IRON AND STEEL

*This article, which is translated from Revue Universelle des Mines (March, 1960), describes a study of the sampling and analyses of gases in steel by an international commission. It gives the results obtained by Belgian investigators on the analysis of hydrogen in molten steel, and outlines the programme of work adopted by all the countries taking part. The orientation which has been given to the work of the nitrogen group is also described.*

ON the initiative of the Liège section of CNRM an international commission was formed in 1957 to carry out such work as would allow of unification, on a European scale, of the methods of gas analysis in steel and iron. This commission filled a definite need, as, up to that moment, it had not been possible for a steelmaker to compare his product from the point of view of gas contents with other products described in the literature. The diversity of methods of taking samples and of analyzing was such that one and the same bath of steel in the molten state could be shown to have once or twice the content according to the method of analysis used.

**By P. TYOU* and M. LACOMBLE†**

The following research organizations and the iron and steel associations of western Europe accepted invitations to send one or more delegates to this commission:—British Iron and Steel Research Association (Sheffield); Norwegian Iron and Steel Research Association SINTEF (Trondheim); Swedish Institute for Metal Research (Stockholm); Verein Deutscher Eisenhüttenleute (Düsseldorf); Max Planck Institut für Eisenforschung (Düsseldorf); Metaalinstituut TNO (Delft); Sous-Comité Autrichien pour les Methodes d'Analyse en Sidérurgie (Ternitz); ARBED (Luxembourg); Institut de Recherches de la Sidérurgie (St. Germain-en-Laye); Comité Français des Gaz (Paris); Nationale Cogne (Aoste); Instituto des Hierro y del Acero (Madrid).

Belgium was represented by M. Marot (CNRM/Hainaut), Demarez (AMS), M. Lacomble (Cockerill-Ougrée), and M. Tyou (CNRM, Liège).

## I. HYDROGEN

Dr. P. Dickens (Mannesmann: Duisburg-Hückingen), president of the chemical section of V.D.Eh., was chosen as president of this international commission. The CNRM (Liège section) undertook the secretarial duties.

At its first meeting, in June, 1957, it was decided to examine first of all the analysis of hydrogen in molten steel. The problem of sample-taking would, naturally, have to be studied separately and the first three meetings were exclusively devoted to this question.

The first meeting was taken up with the presentation of various techniques used in each country. A primary detailed proposition was put forward in full agreement by the French, British, Swedish, and Belgian delegations. This showed that these various delegations were in agreement as to the method of sampling, namely, the "notched-pencil" method. Certain hesitations immediately arose about this proposal, particularly from the German delegation, which had had no experience with this method and wished to experiment with it before giving its consent to its use.

The second meeting was held at Liège in January 1958. The German delegates had now confirmed by experiment that this "notched-pencil" method of sample-taking was both practical and valuable, and an agreement, in principle, was thereby established, in spite of certain misgivings on the part of the Norwegians, who were in favour of the "Taylor-Chipmann" method. Many differences still existed after this agreement in principle on the question of casting in metal moulds and of rapid cooling. Three important questions remained essentially in suspense.

(1) *The Nature of the Mould*—The German delegation defended its thesis under which it was claimed that copper, owing to its high thermal conductivity, was preferable to steel or cast iron. The French delegation was opposed to the use of this metal, as it considered steel was much more practicable, less costly, and gave results, in practice, no different from those obtained with copper moulds.

(2) *The Presence of Notches.*—The German delegation considered that it was very advisable to eliminate notches of cast pencils. These notches

* Head of research, Liège Section of CNRM.
† Head of chemical and spectroanalysis laboratory of Cockerill-Ougrée, S.A.

seemed to be the cause of internal defects and blowholes, and led to difficulty in removing the pencil sample from the mould. The majority of the other delegations wished to keep these notches, considering that they were necessary for easy breaking of the cast pencil and also to regularize the size of samples.

(3) *Method of Quenching.*—In order to avoid oxidization of the pencil and possible absorption of hydrogen during quenching, the German delegation proposed quenching of the pencil before removal from mould. After comparative tests it was found that samples quenched in this way contained less hydrogen than those which had been quenched directly after removal from mould. Although it was not found possible to prove that these differences were due to loss, from too slow cooling after quenching in mould, rather than to hydrogen absorption, through quenching of the bare pencil, it was ultimately decided to quench the bare pencil, that is to say, after removal from mould.

Numerous comparative tests made, especially in Germany, France, and Belgium, allowed of agreement being reached on these three controversial points, after two further meetings held in Hückingen and in Paris, in April and October, 1958, respectively.

The attached text gives a description of the method as defined at the last meeting.

The Belgian delegation took a very active part in the work of the commission by organizing, at the open-hearth plant at Cockerill-Ougrée, a joint technical session, (September 30 - October 2, 1958), at which the German, French, and Belgian steelmakers put forward their experimental results. In addition, numerous tests were made at the steelworks at Seraing so that certain controversial points could be studied, as follow:—

(1) This first investigation was on the question of the choice of a storage medium. Liquid nitrogen solid $CO_2$, mixture of solid $CO_2$, and acetone have been compared as cooling and storing media. Liquid nitrogen gives slightly better results, but the differences as compared with the other two media for storage are hardly significant. From this investigation it was possible to form the idea that the choice between these three storage media could be based on essentially practical considerations and, on these grounds, the choice was made for the acetone-solid $CO_2$ mixture.

(2) A second investigation was made into the two different methods of quenching mentioned above. These tests were in favour of the use of the bare pencil quenching method.

(3) A third series of tests was finally carried out to study the influence of notches on hydrogen content. It was found that this effect was nil, but investigation has, nevertheless, shown the effect of these notches on the shape of internal blowholes and on the ease of fracture of the pencil.

Having exhausted for the time being this problem of sampling, the commission went on to the question of analytical apparatus, properly so-called, during its meeting held in Paris in October, 1958. The principle of extraction under vacuum at about 600 deg. C. and measurement of pressure in a container of known volume looked as if it might serve as a basis for agreement, but the French delegation put the whole question in a new light by revealing its experiments with an extracting apparatus working at 1,100 deg. C., with hydrogen separation by a palladium filter.

The last meeting, at Madrid in October, 1959, was devoted, apart from discussions relating to the definition of a sampling standard, to an examination of the results from tests with apparatus fitted with the palladium filter.

It was shown from tests carried out in the laboratory of Cockerill-Ougée S.A. that this apparatus is definitely more fragile and less handy than the one used in measuring total pressure in the degassing chamber.

On the other hand, the French delegates affirm that this apparatus has been used, without trouble, in production control for a period of about one year. The German delegation has now been entrusted with the task of carrying out tests with this apparatus so as to establish whether the quality of the analyses effectively compensates for the drawbacks of greater fragility and complexity. It is very probable that the principle for analysis will then be definitely chosen after a further meeting.

## II. NITROGEN

A second working group was set up by the international commission in order to tackle immediately the study of questions relating to nitrogen analysis. The aims of this working group are twofold:—

(1) To state precisely the nature of what is being analyzed by the various methods.

(2) To draw up an agreement on the method by which those analyses which are held to be significant shall be carried out (Total N; nitrogen soluble in dilute acids?).

The first meeting of this group took place at Liège in March, 1959, and there were present specialists from the same countries as took part in the hydrogen group (with the exception of Great Britain and the Netherlands).

The practical objective, namely unification of methods, was approached by distributing samples of a typical steel of French origin. Each member is to analyze it, on the one hand for nitrogen soluble in acids and soda and on the other hand for total nitrogen, by the method he chooses. Each member is to send along with his results a detailed description of the methods he has used. Comparative examination of results and methods should allow of rapid decision being made on delicate points of analysis and of deciding on the methods to be used.

The objective set by the first investigation is naturally a much more distant one. It will be necessary to consider the possibilities of physical methods such as internal friction and electrical resistivity, and of chemical methods of the most varied nature. At present, physical methods can only give interpretable information in the case of

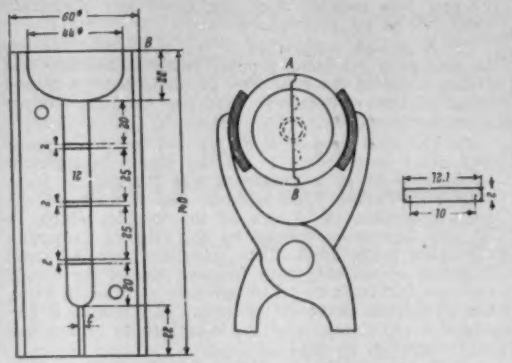


FIG. 1.—DESIGN FEATURES OF COPPER MOULD: THE SIZES ARE IN MM.

relatively pure alloys, but it is certain that these results will allow of progress being made in our knowledge in the field of complex alloys, such as steel.

## III. CONCLUSIONS

The work of the hydrogen group has achieved agreement in so far as sampling is concerned. The sampling instructions agreed upon by all the delegations are appended below. As far as analysis of hydrogen is concerned, it is to be expected that a number of meetings will still have to be held before a general agreement is reached. The nitrogen group, for its part, has hardly started, but great satisfaction can be felt at the very direct manner in which the problems have been tackled.

## APPENDIX

### Operational Instructions for Taking Samples for Hydrogen Analysis from Liquid Steel

Among the various methods of sampling molten steel, casting in a chill mould followed by rapid cooling of sample has been chosen as the best process.

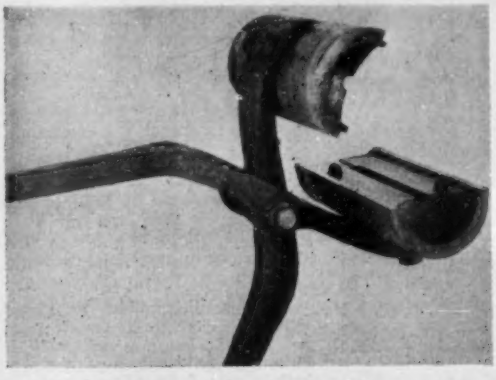


FIG. 2.—MOULD IN CLAMP BEFORE INSERTING RINGS.

*Sampling Mould.*—The copper mould (1) is schematized with sizes in mm. in Fig. 1. It is made up of two semi-cylindrical symmetrical parts, held firmly together by means of a clamp. In order to ensure better filling of the mould and, consequently, greater compactness in the pencil, a 2-mm. dia. hole is made in the bottom of the mould along the centre line of the pencil. The mould is held horizontally in the open position (Fig. 2). It should be clean and dry. (2) Three steel rings are inserted into it (3) so as to get the arrangement shown in Fig. 3, and the clamp is closed to keep the rings in their position.

*Operational Method.*—The molten steel sample is taken by means of a ladle spoon which has previously been coated with the slag from the cast to be sampled. As soon as the ladle spoon is full, the slag, which is floating on top of the steel, is removed by means of a spatula and a piece of aluminium wire is plunged into the metal and

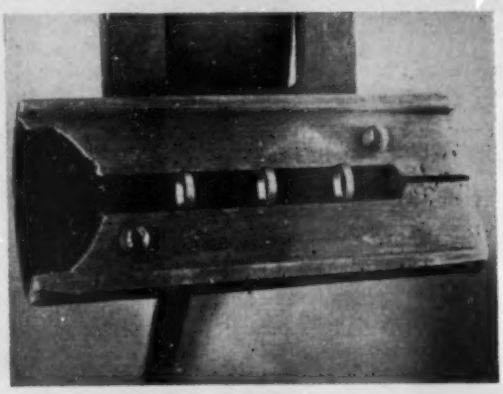


FIG. 3.—MOULD WITH RINGS IN POSITION.

kept in constant contact with the bottom of the ladle spoon. (4) The Al addition must be measured in such a way as to ensure that the content of this element in the final sample may be about 0.2 per cent. With steel which has already been killed, the addition of aluminium may not be necessary. The liquid steel is then poured into the mould, placed on the ground, the clamp being held by a workman. Filling of the mould must be done in one operation. The mould is left to settle for 2 to 3 sec., being placed above a container filled with cold water. The mould is then opened and the sample is shaken out by knocking the mould on the edge of the container. The sample drops into the water, where it is vigorously stirred about for 10 sec. (5) It is then taken out of the water and quickly plunged into a mixture of acetone and solid $CO_2$.

It is of no value to carry out analyses of samples which have been more than 30 sec. in preparing, the time of taking the sample being reckoned from the moment when the ladle spoon is filled to the moment of immersion of the sample in the re-

frigerating mixture. After a few minutes the sample is taken out of the cooling mixture and the head is knocked off. It is then marked and stocked away in the refrigerating mixture until time for its preparation.

*Preparation of Sample.*—A few minutes before analysis is begun, the sample is taken out of the refrigerating mixture and held firmly in a vice. One or two of the central parts of the pencil are separated by a hammerblow. The portion intended for analysis is freed from burrs and any surface oxides, by grinding. This surface must be completely bright.

During grinding the sample is periodically immersed in the refrigerating mixture in such a way as to keep its temperature below that of the surrounding air. After that, the sample for analysis is cleaned with methanol, and finally with ether or acetone. (6) It is dried in a stream of cold nitrogen and put into the extraction apparatus after being weighed. This last operation allows the sample to regain a temperature close to that of the surrounding air.

**Special Notes**

(1) It has been established experimentally that, for taking samples from non-alloy steels, the use of steel or cast iron moulds does not cause any significant difference in the hydrogen results.

(2) A proven method of drying the mould consists in pouring a preliminary pencil (without notches) and taking it out of the chill after about 10 sec. A mould dried in this way can be used for sampling two or three minutes later.

(3) The steel rings must be dry and free from grease and other impurities. To ensure this it is sufficient to keep them in a desiccator and not handle them with bare hands. The number and position of the rings determine the length of the sample, which, in its turn, has to be limited by the type of extraction apparatus being used. The inside diameter (12 mm.) increases appreciably with frequent use of the mould and this fact must be taken into consideration in fixing the outside diameter of the rings (12.1 mm.). If too frequent replacements of the rings are to be avoided split rings can be used.

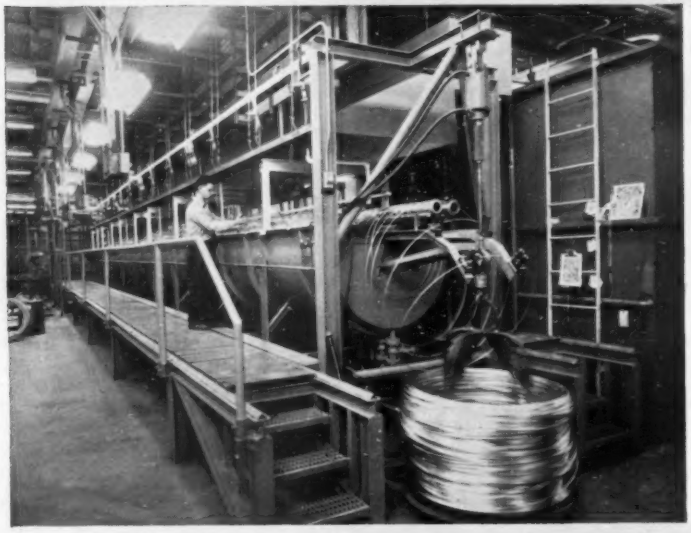
(4) To prevent the aluminium burning on the surface of the steel, the aluminium wire must be kept pressing against the bottom of the mould while it is melting.

(5) The sample should be shaken about in the water either by means of pliers or in a metal basket with a handle. This basket, if used, is placed beforehand in the container filled with water and the sample is dropped into it from the mould.

(6) After this cleaning the sample can no longer be handled with bare hands and tweezers must be used.

# Copper-plated Steel Wire Production

PRODUCTION has started on Copperply copper-plated steel wire at Kidderminster by the National-Standard Company, Limited, a subsidiary of the National-Standard Company, Niles, Michigan, USA. Copperply combines the strength of steel wire with the electrical conductivity and corrosion resistance of copper. It is produced by a patented spiral plating process perfected by National-Standard. The copper-plated steel wire is used as bare or insulated telephone wire, drop wire, guy or messenger strand, lashing wire, aircraft antenna, masonry tie wire, hose reinforcement, decorative jewellery, and in critical electronic applications.



NEW NATIONAL-STANDARD COPPERPLY PLATING LINE.

Copper is electrolytically plated on the steel core as the wire coils through Metalply platers. Any desired thickness of copper can be applied up to 40 per cent. equivalent conductivity. After plating, Copperply is drawn to the required diameter. The bond is unaffected by drawing, bending, twisting, forming, and working.

Concentricity of the copper around the steel is held within 1 per cent. of nominal wire diameter.

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FATAL accidents in Hungary's metal industries last year were nearly half what they were in 1952, although the number of workers had increased by 65 per cent.

*The International Strata Control Conference held in Paris during the third week of May was a major one of its kind. The opening meeting was presided over by M. Jean-Marcel Jeanneney, the French Minister of Industry. During the past decade there had been three other conferences of this type—in Belgium* (1951), *West Germany* (1956), *and East Germany* (1958). *This review of the Paris conference, in which some 500 strata control experts participated, is contributed by a special correspondent.*

# International Strata Control

## *REVIEW OF PARIS CONFERENCE*

IT is generally accepted by every mining engineer that the behaviour of strata in an underground excavation is far too complex to be fully understood as yet. It is also very difficult to generalize on a solution to this particular aspect of mining, as the conditions prevailing in each separate case are so varied. Research workers in all parts of the world are trying to find some solution to this difficult problem of mining engineering. They pool their knowledge in various international conferences and are building up information from all sources.

Since the subject of strata control is a very wide one, the theme of the Paris conference was restricted to a limited number of problems, so as to ensure that the problems in question were thoroughly examined.

### Scope of the Conference

The subjects considered at the conference were:—Supports; studies on small-scale models; rock characteristics; underground measuring methods and equipment; observations and measurements in roadways; observations and measurements in faces; influence of the method of working on the behaviour of the strata—rock bursts. Some 38 papers were given and discussed on these subjects Problems relating to subsidence, work in shafts and in cross-measure drifts, the problem of dealing with methane, were excluded from the conference. National reports on development and trends in roof control from various countries were submitted at the end of the conference.

### Supports

Authors from four countries (Belgium, East Germany, France, and England) contributed papers on the subject of supports. Great significance was attached to the types of walking supports at the coal face. Two separate papers, given by Wright[5] and McLuckie[4], described the progress made on hydraulically operated chock-type and frame-type power-operated supports. The authors agreed that sites for powered supports are limited, though many installations have been highly successful, giving safer working conditions and improved productivity.

McLuckie clearly indicated the main factor for the limitation of this system in pointing out that when a conventional prop is set to the roof as a support it is never removed until such time comes when the roof no longer requires support and is allowed to cave. He further discussed the characteristics of powered support. The application of walking support under pressure, and its subsequent release causing flexure of the roof can have adverse effect on roof control problems if the roof is fractured and requires continued support.

Wright appreciated the necessity of the development of this system, in particular the importance of the cantilever support and the significance of withdrawing resistances of 100 to 120 tons from the roof in succession along the face. He described the Gullick GRS5 system, which overcomes both the problem of maintaining adequate support when chocks are being advanced and reducing the distance from supports to the face. Essentially, this system is a combination of both frame- and chock-type of powered support.

Kuhn[2] dealt with the problems of brittle roof conditions on powered supports. He had studied this aspect thoroughly in the laboratory with photo-elastic analysis and in underground experiments. He concluded that the bar elements which transmit most of the prop resistance to the roof should be plate shaped and be covered with rubber.

### Results from Metal Supports

Dubois[1] gave some interesting results obtained from metal supports (rigid, hydraulic, and friction props) in the coal face. He remarked that the hydraulic prop, with its reliable and high load yield and the regularity of load yield curve which it possesses, is best suited for faces where roof control is difficult. On the other hand, the friction prop, which is less expensive, having a higher buckling load and degree of extensibility, is to be preferred in faces which do not present any particular difficulties and in those where the immediate roof occasionally has rock bursts in small degree. Besides its technical aspect, the paper compared the economics of various types of supports.

Adam and Chassagne[3] described some installations of walking supports in French coalfields and gave some practical hints for their successful operation.

The behaviour of different types of roadway supports in a spectacular scale-model investigation

(reduced to 1:10 reproducing a German pit) was described by Jacobi and Everling[6]. In this experiment actual underground conditions were reproduced in the minutest detail.

The main approach of the paper given by Il'stein[7], of the USSR, to show that roof movements, in a longwall working, depend only slightly on the density and total resistance of the support system. He went on to describe a model experiment, confirmed by pit observations, which clearly showed that the use of constant-resistance props, particularly of the hydraulic type, in comparison with props with a rising resistance, has a positive action in preventing bed separation and improves the conditions in the working area of the faces.

Trumbachev[10] reviewed some investigations carried out in the USSR by photo-elastic methods, on models made from a gelatine-glycerine base—Igdantine. This investigation showed the pattern of stress distribution in the roof, varying in thickness, and in the pillars with elasto-plastic intercalations under varying conditions of contact between beds.

The pressure exercized by stowed rock in inclined seams was discussed by Jahns and Brauner[9], of West Germany. They developed a formula for calculating the pressure exerted by the gravel on the sidewalls of a model inclined at an arbitrary angle, on the roof, on the floor, and on end surfaces. This formula was very closely substantiated to a measurement taken underground in a German pit.

A great deal of basic theoretical work for model experiments, correlating subsidence and strata control, was described by the Polish authors, Bodziony, Litwiniszyn, and Smolarski[8].

### Rock Characteristics

A revolutionary method of testing rocks to destruction was postulated by Protodyakanov[12], of the USSR. Conventional methods of determining rock strength involve the laborious operation of preparing specimens to regular shapes, such as cubes, prisms, or cylinders. Due to the heterogeneity of rock itself and inevitable inaccuracies in the preparation of rock specimens, when such regular shaped specimens are tested, results with wide scatter are obtained. The author suggested that using specimens of irregular shape could be a rapid and simplified method of testing rocks. Results obtained from both regular and irregular shaped specimens were plotted in the form of histograms and the mean value was very close to each other. The author continued by saying that the increased scattering of results obtained by this method was compensated by an increase in the number of specimens tested. In practice, tests were made with irregular-shaped specimens of varying volume, which was measured in a sand-type volume meter.

Pomeroy[13] described a model experiment done in the Mining Research Establishment of the National Coal Board to study the effect of overburden pressure on the forces and energy consumption likely to be required for the extraction of coal by rapid plough. He concluded that unstressed coals are made more difficult to plough by the application of a compressive stress perpendicular to the bedding planes, the effect being most marked for deep cuts in heavily cleated coals. He went on to say that the coal can be weakened and the ploughing forces fall to values corresponding to those encountered in ploughing the unstressed coal.

Two Japanese authors, Horibe and Kobayashi[11], described in detail the properties of rock under triaxial pressure. They found, by means of a triaxial pressure chamber, that the Poissons number of the rock changes with confining and axial pressures. They also noted that the rocks exhibit plastic behaviour even at the low confining pressure of 30 Kg./sq. cm. Their investigations revealed that both the compressive and the tensile strengths increase with the confining pressure.

Jenkins[15], of Great Britain, dealt with the subject of the bearing capacity of mine floors. This is undoubtedly a burning question in practical mining. The author in this paper rationalized the relationship between the bearing capacity and the base size prop for mine floors in an excellent way.

Znanski[14] presented an analytical paper on the mechanical properties of carboniferous rocks with special reference to the sides spalling off from an underground excavation. He established that these rocks, from laboratory experiments, behave like elastic and elasto-viscous bodies.

### Underground Measuring Methods and Equipment

South African mining experts, Denkhaus and Hill[16], well known in the field of metalliferous mining, reviewed the conditions of the ground around excavations in hard rock at great depth. Their observations indicated that the fracture planes in the footwall of an excavation start in an almost vertical direction and then curve away from the solid face at an angle of approximately 55 deg. On the other hand, the fracture planes in the hanging wall were found to dip towards the solid face at an angle of approximately 75 to 80 deg. The authors investigated this fracture zone both optically and by the ultrasonic pulse reflection method, and found that it extended to the order of 15 to 25 ft.

Potts and Tomlin[19], of the University of Durham, gave an account of the recent development of a stressmeter which, when inserted in the rock, is capable of measuring stress changes. The stressmeter in question is cylindrical and is installed in a borehole. The instrument is prestressed with the aid of a hydraulic ram so that the pressure change above or below the present load can be measured. The authors then presented detailed results obtained from a stressmeter in a coal mine in the north of England. Their results showed that when the stressmeter was about 5 ft. 6 in. in front of the face the stress reached its highest peak.

The Japanese author Sujuki[17] gave the results obtained from a load-cell and strainmeter when observing the pressures acting on supports in roadways near workings. The main deduction from his investigation is that the effect of stress changes in

longwall workings sometimes appears in the coal seam 100 metres in front of the working face.

Leeman[20] presented an incomplete research investigation into the measurements of stress in Witwatersrand gold mines, South Africa. The author, employing strain cells and borehole deformation meters, concluded that the effect of blasting at the stope face causes an increase in the vertical normal stress detected as much as 50 ft. ahead of the stope face. The author did not experience any build-up of stress or any other warning preceding the occurrence of rock bursts.

Another novel research programme was described by a Belgian author, Van Duyse[21], where the influence of a moving face on a cross-cut driven in the rock below it will be observed. A photo-elastic varnish on the concrete blocks with which the cross-cut was lined will be studied for this investigation. The measurement of the birefringence will indicate the states of stress in the body being tested.

May[18] in his paper discussed the Canadian development of a stressmeter to measure stress changes in an underground opening. He also referred to the development of an instrument capable of measuring biaxial stresses.

### Observations and Measurements in Roadways

Schwartz[23], of France, presented a thoughtful paper on the possibility of predicting the strata movement in roadways, based on results obtained from underground workings. The author took into account a number of variable factors which influence the strata movement.

Stuffken[26] gave a practical account of the relation between the working depth and roadway maintenance experienced in Dutch mines. The author stated that the extent of roadway deformation is linearly dependent on the thickness of the coal seam worked, and it increases with increasing cover load. He also emphasized that the maintenance increases in proportion to the age of the roadway.

The influence of the methods of driving and supporting in a gate road on the behaviour of strata movement was described by the Belgian authors, Stassen and Liegeois[30]. They concluded that when the workings are deep and in soft rocks, roadways should not be driven in advance of the face and the immediate roof should be allowed to subside *en bloc* to minimize bed separation.

Some useful results obtained from roof-bolted roadways in France were described by Cardon and Buisson[25]. Reference was made to the use of special metal bars connecting the rows of bolts. This system is flexible and can be adapted to changes in the strata or in the pattern of bolting. According to the authors' point of view, bolting is of particular value in retreating faces. They observed that the roof-to-floor convergence was less in a roof-bolted roadway in comparison to a framed support.

Reper and Bruens[22], of the Dutch State Mines, Central Research Establishment, gave an interesting account of measuring loads on roadway support by using strain gauges. This investigation was carried out in three parts:— (*a*) Ten roadway supports, provided with strain gauges, were set up at the roadhead; (*b*) measuring points were provided in the roof, floor, and sidewalls of the roadway for the purpose of measuring convergences and movements; (*c*) on the goaf side, hydraulic measuring capsules were incorporated in timber props along the roadway side of the measuring section. With these, regular measurements were taken of the stresses, loads, and deformation, as a function of time and the distance of the face.

A highly informative paper on the problem of underground roadway damage caused by the relaxation phenomenon of the strata was dealt with by Schuermann[24].

### Observations and Measurements in Faces

A knowledge of the optimum yield of supports is necessary for planning support layout suitable for a given mining condition. This subject was efficiently analyzed by a Russian expert on rock mechanics, Ruppeneit[29], who tackled the problem in the light of the theory of dimensions and similarity. The author's calculated values for the roof displacements were found to be in close agreement with the direct measurements made in 137 faces of 29 pits.

A brief review of the experience gained in Great Britain on the subject of strata control in longwall faces was given by Carter[31]. The author emphasized the important role of stability of the supports since far more supports are displaced than are broken. As a means of attaining this stability the author went on to say that any cavities over prop heads should be filled so as to ensure continuity from roof to floor through the axis of the prop.

An extensive study of the rock movements during excavation by the longwall method in two Czechoslovakian collieries was described by Sibek[27]. His study revealed the following criteria:—(*a*) The chief problem in faces and roads are floors of low load-carrying capacity; (*b*) the load-bearing capacity of the floor and its resistance to penetration decreases with time; (*c*) at a distance of about 25 metres behind the face, the pressure of the caved strata produced approximately 80 per cent. of the cover load on the floor.

A new approach to the investigation of strata pressure in Poland was given in a paper by Borecki and Saluslowiez[32]. Reference was made to the use of radioactive isotopes to measure the state of stress inside the solid coal. This method of stress measurement makes use of changes in the secondary radiation occurring as a result of changes in the stress obtaining in the rock under investigation. The apparatus consists of a pipe of 1.1 metre long with a $Co^{60}$ radiation isotope filled at one end and a Geiger-Muller counter at the other; the latter transmits the pulses to the pulse-converter.

In his paper Dubois[28] discussed some of the factors which influence the convergence at the face on the basis of results obtained in French mines. The author concluded that the predominating factors which influence convergence are the rate

of advance, the thickness of the seam, and the treatment of the goaf.

The effectiveness of roof control by stowing in comparison to the caving system is a subject of controversy and this was dealt with by Spruth[34], the well-known German expert on strata control. A number of faces in the Ruhr, using pneumatic stowing and caving simultaneously, were investigated in respect of their face convergence. To attain the same degree of roof control in caving as is found in faces with pneumatic stowing, according to Spruth, the prop density must be about 10 per cent. greater in caving faces than in pneumatically stowed faces.

Tincelin and Sinou[32], of France, formulated some theoretical laws from practical experience of collapsing areas worked by leaving small pillars. This paper is very beneficial for both theoretical and economic aspects of mining.

Labasse[33], of Liège University, Belgium, discussed the behaviour of the surrounding rock when coal is exploited. He also supports Spruth's view that stowing gives better roof control than caving. According to Labasse, however, a hard roof, which causes rock bursts, should cave in controlled manner.

The Russian author, Avershin[36], presented a paper on the investigations carried out on the problem of rock bursts in coal mines. He also explained the usefulness of model experiments in studying rock bursts. These model investigations showed that the presence of a band of stronger stratum in the rock strata leads to a marked reduction in the pressure concentrations under this band.

Speckeler, Gimm, Hofer, and Duchrow[37] in their joint paper contributed some extra knowledge on the subject of rock bursts as experienced in potash mines in East Germany. Before the rock bursts, dull bumps had repeatedly been heard during drilling operations indicating releases of stresses. A point of particular interest in their investigations is the apparent influence of shotfiring on the timing of the rock burst. Vigier and Panczuk[35] gave an interesting paper on the anomalies obtained in convergence records in French potash mines before any major bursts took place.

Every paper was discussed with lively interest among the members of the conference.

The salient points in the national reports of certain countries, presented at the close of the conference are given in Table 1.

TABLE 1.—*Salient Points in the National Reports of Certain Countries.*

| Country. | Annual coal production million metric tons). | | Mining method per cent. distribution. | | | | | | Treatment of roof in | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Longwall. | | | | Room and pillar. | | Others. | | Complete stowing. | | Partial stowing. | |
| | 1951. | 1958. | 1951. | 1958. | 1951. | 1958. | 1951. | 1958. | 1951. | 1958. | 1951. | 1958. |
| Austria .. .. .. | 3.50 | 4.36 | 22.5 | 33 | 0.3 | 0.2 | 77.2 | 66.8 | 5.7 | 5.6 | — | — |
| Bulgaria .. .. .. | (1939) 4 | 12.73 | — | 80 | — | 12 | — | 8 | — | 3 | — | 3 |
| West Germany .. .. | 118.9 | 132.6 | 95.6 | 94.9 | — | — | 4.4 | 5.1 | 22.9 | 49.7 | 10.9 | 1.2 |
| Great Britain .. .. | 212.2 | 200.8 | 88.4 | 92.6 | 10.1 | 6.4 | 0.5 | 1.0 | (1954) 5.3 | 4.2 | (1954) 75.7 | 68 |
| Hungary .. .. .. | (1953) 21 | 24.1 | (1953) 38.2 | 39.6 | (1953) 28.4 | 29.5 | (1953) 33.4 | 30.9 | (1953) 24 | 19.8 | — | — |
| Holland .. .. .. | 12.42 | 11.88 | 95.8 | 94.5 | — | — | 4.2 | 5.5 | 25 | 25.7 | — | — |
| Poland .. .. .. | 81 | 92 | 41 | 52 | 33 | 22 | 26 | 25 | 19 | 22 | 15 | 14 |
| Japan .. .. .. | 46.49 | 49.93 | 54.8 | 66.8 | — | — | 45.2 | 33.2 | — | 10.9 | 62.7 | 22.5 |
| USA .. .. .. .. | 518.1 | 388.3 | — | — | — | — | — | — | — | — | — | — |
| USSR .. .. .. | (1950) 261.1 | 495.8 | (1950) 54.6 | (1957) 47.6 | (1950) 38.3 | (1957) 47.7 | (1950) 7.1 | (1957) 4.7 | (1950) 1.0 | (1957) 1.0 | (1950) 26 | (1957) 18.4 |
| Belgium .. .. .. | 29.7 | 27.1 | 100 | 100 | — | — | — | — | 9.0 | 14.0 | — | 13.2 |
| France .. .. .. | 53.5 | 58.6 | 67.5 | 67.6 | 2.9 | 1.2 | 29.6 | 31.2 | 31.8 | 30.6 | 10.2 | 5.1 |

## APPENDIX


[1] L. Dubois, "Twenty-five Years' Experience with Metal Face Supports in the Winterslag Collieries."
[2] O. Kuhn, "Investigations into the Adaptability of Hydraulic Frame-supports to Brittle Roof Conditions."
[3] R. Adam and C. Chassagne, "The Application of Self-advancing Hydraulic Supports at the Bruay Group of the Nord and Pas-de-Calais Coalfields."
[4] A. D. McLuckie, "Frame-type Powered Supports."
[5] A. Wright, "Practical Applications of Chock-type Power-operated Support Systems."
[6] O. Jacobi and G. Everling, "Model Investigations into the Action of Different Types of Roadway Supports."
[7] A. Il'stein, "Influence of the Resistance of the Support System on Manifestations of Rock Pressure in Longwall Faces."
[8] J. Bodziony, J. Litwiniszyn, and A. Smolarski, "New Research into Rock Masses Treated as Media Characterized by Stochastic Equations."
[9] H. Jahns and G. Brauner, "Stowing Pressure in Steep Seams."
[10] V. F. Trumbachev, "Experimental Investigations into the Distribution of Stresses in Inhomogeneous Pillars and Roof Rock Using the Photo-elastic Method."
[11] T. Horibe and R. Kobayashi, "Physical and Mechanical Properties of Coal-measure Rocks under Tri-axial Pressure."
[12] M. M. Protodyakanov, "New Methods of Determining the Mechanical Properties of Rock."
[13] C. D. Pomeroy, "Laboratory Experiments to Investigate the Effect of Overburden Pressure on Coal Ploughing."
[14] J. Znanski, "Gradual and Sudden Collapse of Surrounding Rock into a Mining Excavation."
[15] J. D. Jenkins, "A Laboratory and Underground Study of the Bearing Capacity of Mine Floors."
[16] H. G. Denkhaus and F. G. Hill, "Conditions of the Ground Around Excavations in Hard Rock at Great Depth."
[17] K. Suzuki, "Investigation of Earth-pressure Variations Around Underground Wall Workings."
[18] A. May, "The Measurement of Stress in the Interior of Rock Surrounding Underground Openings."
[19] E. L. J. Potts and N. Tomlin, "Investigations into the Measurement of Rock Pressure in the Mine and the Laboratory."
[20] E. R. Leeman, "Measurements of Stress in Abutments at Depth."
[21] H. Van Duyse, "A Study of the Influence of a Moving Face on a Cross-cut Driven in the Overlying Strata."
[22] F. J. M. de Reeper and F. P. Bruens, "Measuring Loads on Roadway Supports by Means of Strain Gauges."
[23] R. Schwartz, "Prediction of Rock Movement in Roadways."
[24] F. Schuermann, "Combating Relaxation Movements in Roadway Walls."
[25] R. Cardon and R. Buisson, "Roof Bolting in Roadways."
[26] J. Stuffken, "Influence of the Depth and Other Factors on the Rock-pressure Effects Around Cross-cuts and Roads and the Maintenance Work so Caused."
[27] V. Sibek, "Pressure and Deformation of Tertiary Rock During the Working of a Thick Seam of Brown Coal by Advancing Longwall Slices with Stowing."
[28] R. Dubois, "The Various Factors Governing Face Convergence."
[29] K. V. Roppeneit, "Experience Gained in the Application of the Theory of Dimensions for Determining Roof Displacements in Faces Taking the Time Factor into Consideration."
[30] P. Stassen and H. Leigeois, "Differing Behaviour of a Type of Rock in a Gate Road as Affected by the Methods of Driving and Supporting."
[31] W. H. N. Carter, "Review of Strata Control Experience in Longwall Working in Great Britain."
[32] M. Borecki and A. Salustowicz, "Polish Experimental Work in the Field of Rock Mechanics."
[33] H. Labasse, "Influence of Roof Control on Coal Winning and on the Behaviour of the Surrounding Rock."
[34] F. Spruth, "Comparison of Rock Movements with Steel Supports in Stowed and Caved Faces."
[35] G. Vigier and T. Panczuk, "Investigations into Strata Movement and into the Anomalies Revealed in the Domaniales Potash Mines of Alsace."
[36] S. G. Avershin, "Some New Methods and Results of Experimental Investigation into Rock Pressure Manifestations During the Working of Coal Seams."
[37] G. Sprackeler, W. Gimm, K. H. Hofer, and G. Duchrow, "New Data on Rock Bursts in Potash Mines."
[38] E. Tincelin and P. Sinou, "Collapse of Areas Worked by the Small Pillar Method—Practical Conclusions and an Attempt to Formulate Laws for the Phenomena Observed."


| waste per cent. distribution. | | | | Roadway support per cent. distribution. | | | | | | | | General remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Complete caving. | | Others. | | Metal. | | Timber. | | Strata bolting. | | Others. | | |
| 1951. | 1958. | 1951. | 1958. | 1951. | 1958. | 1951. | 1958. | 1951. | 1958. | 1951. | 1958. | |
| 92.1 | 93.7 | 2.2 | 0.7 | 80 | 79.3 | — | — | — | 0.1 | 20 | 20.6 | Average rate of advance is 1.2 m./day in 80 m. long face. |
| — | 44 | — | — | — | 25 | — | 75 | — | — | — | — | Experiments on ceramic blocks for main roadway support are in progress. |
| 36.5 | 46.6 | 29.7 | 2.5 | — | 86.73 | — | 1.77 | — | 0.03 | — | 11.47 | Pneumatic stowing is getting more popular. |
| (1954) 19 | 27 | — | — | — | — | — | — | — | — | — | — | Tendency is towards powered supports. |
| (1953) 47 | 58.7 | (1953) 29 | 21.5 | (1953) 2.1 | 14.8 | (1953) 97 | 71.1 | — | — | (1953) 0.9 | 4.1 | Hydraulic stowing is widely practised. |
| 75 | 73.7 | — | 0.6 | 96.3 | 98.1 | — | — | — | — | 3.7 | 1.9 | In 1958, 33.6 per cent. of total output is from fully mechanized faces. |
| 15 | 26 | 51 | 38 | — | 60 | — | 40 | — | — | — | — | Average length of metal roof bars at the face is 1.4 metres. |
| — | 37 | 37.3 | 29.6 | 5.2 | 15.2 | 69 | 52.5 | — | — | 25.8 | 32.3 | Consumption of steel supports are 1.60 and 0.12 kg/ton of net output in roadways and faces, respectively. |
| — | — | — | — | — | — | — | — | — | — | — | — | Development of precast mine supports is in progress. |
| (1950) 70.1 | (1957) 76.9 | (1950) 2.9 | (1957) 3.7 | — | — | — | — | — | — | — | — | Production of fibre glass prop which has strength of 3,000 to 5,000 kg./cm.[2] |
| 81.0 | 72.8 | — | — | — | 97 | — | 2.5 | — | 0.3 | — | 0.2 | Only metal supports used in faces of which 75 per cent is prop free front. |
| 50.4 | 57.8 | 7.7 | 6.5 | 58.7 | 74.7 | — | — | 1.7 | 1.9 | 12.1 | 5.86 | Successful working method of steep seam with hydraulic stowing. |

# New Patents

PATENTS below are among the complete specifications accepted listed in the Official Journal (Patents). The numbers given are those under which the specifications have been printed and all subsequent proceedings will be taken.

Applications for copies of the full specifications (3s. 6d. each, post free) should be made to the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C.2.

### Mining and Mining Appliances

835,269 COLMOL COMPANY. Mining machines.
835,125 COLMOL COMPANY. Mining machines.
835,432 COLMOL COMPANY. Mining machines.
835,448 BRITISH THOMSON-HOUSTON COMPANY, LIMITED. Winding and haulage equipment.
835,142 MINING ENGINEERING COMPANY, LIMITED. Roof supports for mine workings.
835,062 EICKOFF MASCHINENFABRIK UND EISENGIESSEREI GEB. Coal-getting apparatus.
835,325 BOCHUMER GESELLSCHAFT FÜR GRUBENAUSBAU UND TECHNIK. Rigid joints for mine roof or wall mine supporting structures.
835,346 GERLACH, K., and GERLACH, H. Pitprops consisting of several component parts.
835,358 JOY MANUFACTURING COMPANY. Mineral-mining machines.
834,976 EGGEMANN, W., and CAMPENHAUSEN VON., E., (trading as SCHWARZ KOMM. GES., H.). Pitprops and like support elements.
835,701 COAL INDUSTRY (PATENTS), LIMITED. Railway wagon retarding devices.
835,911 USSPURWIES, G.m.b.H., J. Shoring for use underground.
835,933 COAL INDUSTRY (PATENTS), LIMITED. Apparatus for detecting carbon monoxide.

### Metallurgy and Engineering

834,603 FOUNDRY SERVICES, LIMITED. Production of ingots.
834,653 CROSS MANUFACTURING COMPANY (1938), LIMITED. Production of hardened steel, wire, rod, and products made therefrom.
835,108 DE GROOT, J.G. (trading as HANDELSONDERNEMING OCEANA). Scraper chain conveyor.
835,261 COMPTOIR INDUSTRIEL D'ETIRAGE ET PROFILAGE DE METAUX. Methods of hot boring of metal billets.
835,133 SPENCE (ENGINEERS), LIMITED, F. W. Endless belt conveyors.
835,298 FENNER & COMPANY, LIMITED, J. H. Production of power transmission and conveyor belting.
835,058 HOUILLERES DU BASSIN DE LORRAINE. Methods of cleaning iron-ore fines notably for the manufacture of ferrous coke.
835,463 HILGER, O., and FRIEDRICHS, H. (trading as BERGISCHE STAHL-INDUSTRIE), and IMDUGUS GESELLSCHAFT FÜR INDUSTRIELLE GASUERWENDUNG. Decarburization of cast iron.
835,146 LOEWY ENGINEERING COMPANY, LIMITED. Ring rolling mill.
835,084 BABCOCK & WILCOX, LIMITED. Method of continuously casting metals.
835,159 BRITISH OXYGEN COMPANY, LIMITED. Treatment of molten ferrous material.
835,513 DEMAG A.G. Rotary metallurgical converter.
834,973 COCKERILL-OUGREE S.A. Manufacture of mill rolls.
835,372 DEUTSCHE EDELSTAHLWERKE A.G. Heat-resistant alloy.
835,731 BRITISH IRON AND STEEL RESEARCH ASSOCIATION. Shaft furnaces.
835,794 METALLGESELLSCHAFT A.G. Method of dearsenicating arsenical oxidic iron ores and roasted ores.
835,613 HÜTTENWERKE OBERHAUSEN A.G. Method of and apparatus for controlling the blow in steel converters.
835,825 AJAX MAGNETHERMIC CORPORATION, formerly MAGNETHERMIC CORPORATION. Method and apparatus for the induction heating of billets and the like.
835,666 METALLGESELLSCHAFT A.G. Sintering apparatus.
835,537 UNITED STATES STEEL CORPORATION. Process for quenching hot-iron powder agglomerates.

### Fuel Treatment and Utilization

835,213 YEADON, S. N. and YEADON, J. N. (trading as YEADON SON & COMPANY and LEEDS BRIQUETTE WORKS). Machines for producing combustible briquettes.
835,695 HUMPHREYS & GLASGOW, LIMITED. Gas-making plant.
835,890 BERGWERKSVERBAND G.m.b.H., formerly BERGWERKSVERBAND ZUR VERWERTUNG VON SCHUTZRECHTEN DER KOHLENTECHNIK G.m.b.H. Scrubbing of hydrogen sulphide from coke-oven gases or the like.
835,900 BRIKO N.V. Process for the manufacture of fuel briquettes.
835,635 CHEMICAL ENGINEERING WILTONS, LIMITED. Tar distillation plant.

### Amended Specification Published

796,550 SIMON-CARVES, LIMITED. Coal or ore washing plant.

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# Metal Spray Coating for Corrosion Prevention

INTRODUCTION of "Berkalloy," a metal spray coating for the prevention of corrosion of iron and steel is announced by the coating division of F. W. Berk & Company, Limited, London, N.W.10. "Berkalloy," a zinc-aluminium alloy in powder form for spraying with Berk flame-spraying equipment, has been evolved after intense research to produce a coating which has universal corrosion prevention properties and so combines the advantages of both zinc and aluminium.

Zinc, of course, lasts longer as a coating in alkaline conditions than aluminum, whereas aluminium gives better results in acidic atmospheres. Tests over a period of several years have shown that the new coating gives equal protection in both conditions.

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### Aluminium in Shipyards

In 1951, the Aluminium Development Association produced an information bulletin on "Working Aluminium in Shipyards." In the intervening years considerable progress has been made in techniques with aluminium—especially in connection with jointing processes—and much experience has been gained in shipyard practice. A new edition has, therefore, been compiled and is available (price 2s.) from the association at 33, Grosvenor Street, London, W.1.

*While in pilot-plant tests, the United States Steel Corporation has proved that its two-stage iron-ore reduction process utilizing hydrogen, and known as the Nu-Iron process, is technically feasible and a 2,000-ton/day commercial unit has been designed, economic considerations have delayed construction. This is explained in a paper by T. F. Reed, J. C. Agarwal, and E. H. Shipley presented at the annual meeting of the American Institute of Metallurgical Engineers. The authors give a detailed description of experimental work leading to the development of a pilot plant, details of which have been published in the April, 1960, issue of the Journal of Metals. A summary of the paper is appended.*

# THE NU-IRON PROCESS

## *Fluidized-bed Ore Reduction*

REDUCTION rate of iron oxide, as is well known, increases rather rapidly with temperature. On the other hand, at certain temperatures the reduced iron-powder particles tend to stick, not only to the walls of the reactor but also to each other, causing tendency to defluidization of the bed. Finally, iron reduced at a temperature below 600 deg. C. is pyrophoric; therefore, special procedures are required to handle the product safely.

After reviewing these basic factors, it was decided to investigate the reduction of iron oxide in the temperature range of 650 to 760 deg. C. where: (1) the reaction rates are rapid; (2) defluidization tendencies are not severe and can be overcome, and (3) the powder produced is not pyrophoric when cold.

Further consideration was then given to thermodynamic equilibrium, which dictates that below approximately 600 deg. C., FeO cannot exist and that the reduction path is from $Fe_3O_4$ to Fe. If the reduction is performed below 530 deg. C. by the route $Fe_3O_4$ to Fe, the equilibrium constant for the reduction with hydrogen is very low; hence, only a very small quantity of the hydrogen reacts with $Fe_3O_4$ to form iron. For example, with hydrogen as the reducing gas at 480 deg. C. only 14.5 per cent. of hydrogen can react. If a mixture of CO and $H_2$ is utilized, the reduction is hindered because the CO and $H_2$ react together to give methane.

If the reduction is performed at 700 deg. C., $Fe_3O_4$ cannot reduce directly to iron, but must reduce first to FeO; then FeO reduces to Fe. The equilibrium constant of 1.2 for the reduction of $Fe_3O_4$ to FeO with hydrogen is considerably higher than that of 0.42 for the reduction of FeO to Fe. Therefore, the off-gases from the reduction of FeO to Fe will have surplus reducing power for the reduction of $Fe_3O_4$ to FeO, thus opening up the possibility of a two-stage reduction process in which $Fe_3O_4$ is reduced to FeO in the first stage with the off-gases from the second stage, and the FeO reduced with fresh reducing gases to Fe in the second stage. Utilization of the off-gases from the FeO to Fe reduction to reduce $Fe_2O_3$ or $Fe_3O_4$ to FeO results in a marked improvement in the proportion of the reducing gases utilized in the reduction process. Thus, with a two-stage process there is less bypassing of solids and gases.

In addition to these considerations, economic analysis indicated that recycling of partially spent reducing gas would be essential. Under these conditions, any carbon-bearing gas would ultimately be removed from the system as carbon dioxide. If a mixture of carbon monoxide and hydrogen were the reducing gas, the carbon dioxide would have to be removed from a relatively large stream of recycle gas.

Further, it was indicated that it would be cheaper to convert the carbon monoxide in the fresh reducing gas to carbon dioxide by water-gas shift and remove the carbon dioxide from a relatively small volume of fresh reducing gas.

The Nu-Iron process was conceived with these fundamentals in mind. In essence, the process consists of the following steps:--Dried ore sized to −10 mesh is preheated to approximately 870 deg. C. in a separate multi-stage ore heater, this temperature being about 150 deg. C. higher than the reduction reaction temperature, in order to supply the required endothermic heat for the reduction of $Fe_2O_3$ or $Fe_3O_4$ to FeO. Preheated ore is transferred continuously to the first stage of the reducing reactor, where it is reduced to FeO at 700 deg. C. and 15 to 25 lb./sq. in. by the hot off-gases from the second stage. The partially reduced ore flows continuously to the second stage of the reducing reactor, where it is reduced to powdered iron at 700 deg. C. by the fresh reducing gas. The 90 to 95 per cent. reduced iron powder is briquetted, cooled, and stored for processing into steel. No passivation of the briquettes is required, as the cold briquettes are not pyrophoric and do not oxidize on exposure to weather.

The make-up reducing gas, which in most of the pilot-plant development work was 97 to 98 per cent. pure $H_2$, is mixed with the purified recycle gas, heated to about 870 deg. C. and under a pressure of 25 lb./sq. in. at the foregoing temperature is introduced at the bottom of the second stage of the reducer, where it supplies the endothermic heat of reaction and completes the reduction of the

FeO from the first stage to iron powder. The off-gases from the second stage continue to the first stage of the fluidized reactor, where they partially reduce $Fe_2O_3$ or $Fe_3O_4$ to FeO. The hot dust-laden gases at 700 deg. C. are partially cooled by exchanging heat with the cold-reducing gases. The partially cooled gases are cleaned and further cooled in a cold-water scrubbing tower, where the water formed in the reduction of iron oxides by hydrogen is removed prior to compression and recycle.

In the Nu-Iron process, because the reduction is performed under the conditions of the $Fe_2O_3$ to FeO and the FeO to Fe equilibria, 32 to 36 per cent. of the $H_2$ in the reducing gas is converted to water in the reduction of the iron oxide. Thermodynamically, this is a highly efficient use of the reducing gas in a single pass through the reactor. As a result, in the process the ratio of recycled gas to the fresh make-up is only 2:1. Thus the cost of purification and recompression of the recycle gas is considerably lower than in other processes.

To prevent the inerts in the fresh make-up gas from building up to an excessively high fraction of the total reducing-gas stream, a small amount of purified gas is purged, and the concentration of the inerts (carbon monoxide and carbon dioxide) in the reducing gas going to the reactor is controlled at about 15 per cent. Here again, because of the high efficiency of utilization of the reducing gas in the process, the amount of reducing gas thus purged or wasted from the reduction system is only about 5 to 7 per cent. of the fresh make-up gas when the make-up $H_2$ is 98.5 per cent. pure. In the commercial design of the Nu-Iron process, 98.5 to 99.9 per cent. pure $H_2$ could be utilized as the make-up gas.

### Pilot Plant

To obtain design and development information on the Nu-Iron process, US Steel Corporation built and operated a pilot plant at the ore-treating laboratory of the South Works in Chicago. In the pilot plant, make-up gas is produced in a tube-type reforming furnace by reacting natural gas with steam in the presence of a catalyst. The CO in the reformed gas is converted to $CO_2$ in a water-gas-reaction shift converter by reacting the CO with steam in the presence of a catalyst at 310 to 420 deg. C. The gas leaving the shift converter is cooled to condense water vapour.

After compression to 60 lb./sq. in., the cooled gas is scrubbed with aqueous mono-ethanolamine in a packed adsorption column to remove $CO_2$. The gas leaving the $CO_2$-removal unit contains approximately 97 per cent. $H_2$. The mono-ethanolamine solution is reactivated by heating with steam in the stripper. This fresh make-up gas is mixed with cooled, cleaned, and compressed recycle gas from the reduction system. The mixture, called reducing gas, goes to the ore-reduction system.

Reducing gas is first preheated to reaction temperature in an indirectly fired tubular heater and then sent to the bottom reactor. The gas passes upward through the two reactors, fluidizing and reacting with the solids in each bed. To minimize dust carryover between stages, the gas from the bottom bed passes through an external cyclone before entering the top bed. The dust from this cyclone is collected, weighed, and analyzed. After the off-gas leaves the top reactor, it is cleaned by being passed through a series of cyclones, a venturi scrubber, and an entrainment separator. The dust collected in the cyclones is returned to the top bed. The cleaned gas is cooled in a direct-contact water cooler, which also serves to condense the water formed in the reaction between hydrogen and iron oxide in the beds. Part of the cooled-gas stream is purged to remove inerts, the remainder being recycled to be mixed with fresh make-up gas.

The fluidized-bed ore-reduction unit in Fig. 1 consists of two 16½-in. stainless-steel vessels mounted one above the other to allow for continuous gravity flow of solids downward and a countercurrent flow of gas upward. Each vessel is surrounded by a furnace chamber in which natural gas is burned to maintain the fluidized bed at the desired temperature. In the top vessel (first stage), the incoming ore feed is reduced to FeO (equivalent to 33 per cent. reduction) by the off-gas from the lower vessel. The solid product from the primary reactor is then, in turn, reduced to metallic iron in the lower unit (second stage) by the incoming reducing gas.

Considerable design information was obtained from the operation of this pilot plant. In a typical run, the temperatures at the top first-stage and second-sage fluidized beds were controlled at 700 deg. C. The bed height of the first stage was maintained at 5.5 ft. and that of the second stage at 12 ft. by means of properly sized downcomers. The reducing gas was 85 per cent. $H_2$ at a flow rate of 6,250 cu. ft./hr. this gas flow maintaining a fluidization velocity of 1.5 ft./sec. in the second stage. The fresh make-up gas was 97 per cent. $H_2$ at a flow rate of 1,829 cu. ft./hr. Dried −10-mesh

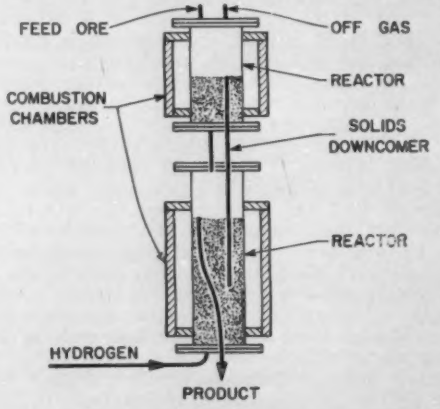


FIG. 1.—NU-IRON PILOT-PLANT REACTOR CONSTRUCTION.

Venezuelan ore was fed to the pilot plant at the rate of 250 lb./hr. the overall rate of oxygen removal being 64 lb./hr. Approximately 90 per cent. reduced iron was withdrawn from the system at 184 lb./hr. The reduced iron powder was briquetted in a roll-type press for use in steelmaking.

With the encouraging results and the information obtained in the pilot plant, the design of a 2,000-tpd Nu-Iron plant was undertaken.

According to the design of this plant minus ¼-in. ore is first dried in a fluidized-bed drier, and the +10-mesh material from this drier is ground in a closed circuit rod mill grinding system to produce a −10-mesh feed for the Nu-Iron process. The dried −10-mesh ore is conveyed to a two-compartment fluidized-ore heater in which the ore is heated to approximately 870 deg. C.

The preheated ore is transferred to the ore reducer, in which the ore is reduced first to FeO and then to approximately 90 per cent. reduced iron powder. This product is transferred to a stripper that strips out entrained hydrogen and is then briquetted while hot. The briquettes are cooled in an inert atmosphere to produce material for the steelmaking operation.

In view of the facts that the Nu-Iron pilot-plant results look good and that a commercial-size plant has been designed, it is natural to wonder why a commercial plant has not yet been built. The reason is not one of technical difficulty, but rather one of economics. Careful evaluations have indicated that in its present stage of development and under prevailing conditions, the Nu-Iron process is not competitive with the blast-furnace process as a source of iron units for producing steel ingots in the continental US, except in a few areas where coking coals are not available and natural gas is very cheap. A cost comparison, to be valid, must be based on the cost of making steel ingots from two different sources of iron units: molten metal and cold briquettes. Thus, the Nu-Iron product has the economic disadvantage that it requires additional heat for melting in the steelmaking process, and based on the facts, US Steel Corporation has decided to continue the development of the process with special emphasis on the economics.

# *New Literature*

NEW catalogues, booklets, and other publications which have recently been received include those mentioned below. Readers interested in obtaining a copy of any of the publications referred to should apply direct to the address given, at the same time mentioning IRON AND COAL.

VICTOR PRODUCTS (WALLSEND), LIMITED, Wallsend-on-Tyne—Technical bulletin No. 39 deals with the company's miniature fluorescent bulkhead lighting fitting.

HEAD WRIGHTSON & COMPANY, LIMITED, Teesdale Ironworks, Thornaby-on-Tees—Wright Ahead, the company's news letter, is filled with news of the companies in the Head Wrightson group.

VULCAN BOILER & GENERAL INSURANCE COMPANY, LIMITED, 67, King Street, Manchester 2—Contents of the July issue of Vulcan, a quarterly journal for power users, include articles on "Heat Exchangers" and "Corrosion in Metals."

TIN PUBLICATIONS, LIMITED, 8, Spring Gardens, Trafalgar Square, London, S.W.1—This is the centenary year for the UK bronze penny. The July issue of Tin carries an interesting article on the use of tin in the world's coinage. Among the other features designed to interest producers and consumers of tin is an article on the "Growing Uses of Tin in Application with Cast Iron."

GENERAL ELECTRIC COMPANY, LIMITED, Erith (Kent)—The standard range of vacuum furnaces made by the company in association with Vacuum Industrial Applications, Limited, and the British Geco Engineering Company, Limited, are dealt with in two new publications. Vacuum induction furnaces (publication E 46) are suitable for melting and casting metals gas free, from crucibles ranging in capacity from 1 lb. to 1 ton. The work chamber and oil-diffusion pump are mounted on one framework, the rotary pump being mounted separately to avoid vibrating the furnace. Publication E 47 indicates that "cold-retort" types of vacuum resistor furnaces are available and are suitable for the laboratory or for production. Sintering, brazing, melting, and heat treatment under vacuum are typical applications for this type of furnace.

ROAD AND RAIL ASSOCIATION, 5, Carlos Place, London, W.1—The association has issued the first two of a series of pamphlets on "Britain's Transport Crisis," giving a Conservative's view (the author is Mr. Geoffrey Wilson, MP, chairman of the Conservative Transport Committee in the House of Commons) and a Socialist's view (by Mr. Ernest Davies, formerly chief Labour spokesman on transport in the House of Commons and now editor of Traffic Engineering and Control). The pamphlets cost 1s. each.

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**Robert Horne Memorial Lecture**

The Society of Chemical Industry announces that the fourth Robert Horne Memorial Lecture, by Prof. F. D. Richardson, entitled "The Extraction of Metals and the Chemistry of Metals," will be delivered in the lecture theatre of the Chemistry Department of Bristol University, Woodland Road, Bristol 8, at 6.30 p.m. on September 29. All interested persons are welcome to attend.

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**IPE's E. W. Hancock Paper**

The 1960 E. W. Hancock paper of the Institution of Production Engineers will be given by Mr. John Marsh, director of the Industrial Welfare Society, at the Royal Commonwealth Society, London, on September 21, at 6.30 p.m. The subject will be "The Cult of the Self-made Man." The meeting will be open to non-members of the institution. Application for tickets should be made to the Secretary, Institution of Production Engineers, 10, Chesterfield Street, Mayfair, London, W.1.

## HYDRAULICALLY DRIVEN

# *Short Portable Conveyor*

DEVELOPED by the National Coal Board's Central Engineering Establishment is a short portable conveyor powered by a hydraulic motor. Although originally designed for use in the stable holes of mechanized faces to cut down the wasteful operation of "casting back," this conveyor has also proved sufficiently light and portable to be lifted into the pack holes where it can serve a similar purpose on the ripping shifts.

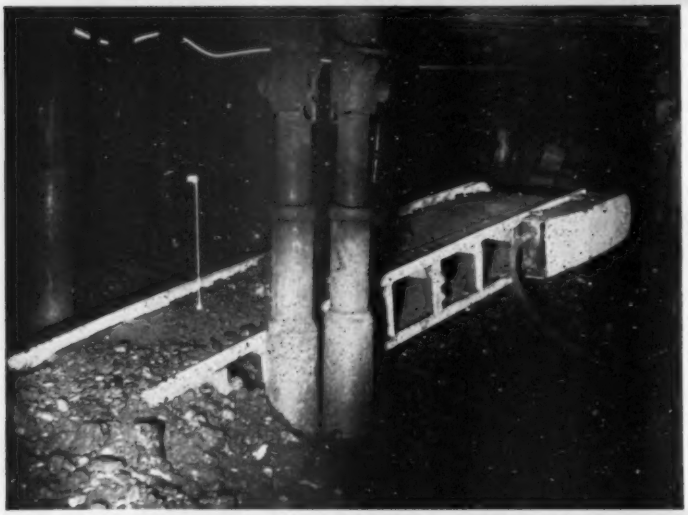

FIG. 1.—THIS HYDRAULICALLY DRIVEN SHORT PORTABLE CONVEYOR AVOIDS WASTEFUL "CASTING BACK."

It consists of a light but robust tubular frame, 8 ft. long, carrying an 18-in. wide belt. Because of the lightness of the hydraulic motor, the combined weight of the motor and driving drum is considerably less than that of an equivalent electrically driven drum. The total weight of a single conveyor, including hydraulic motor, is only 270 lb.

Several of these conveyors can be driven from a single hydraulic power pack, each motor requiring 2½ gal./min. at 600-1,000 lb./sq. in. The speed is regulated by a control valve which also ensures an even distribution of power when more than one conveyor is being driven from the same power source. All bearings are sealed and therefore require no lubrication.

Where a hydraulic power pack is already in use, as on fully mechanized faces, this can also be used to drive the conveyor motor, with obvious economic advantages and convenience. For example, one of these conveyors has given trouble-free service for about six months while operating from a 5 per cent. soluble oil and water hydraulic system supplying power to the self-advancing supports on a face. It is interesting to note that this was in a 2-ft. seam, a fact which emphasizes the lightness and manœuvrability of these units.

Fig. 1 shows a conveyor which was made at the CEE with a direct-coupled hydraulic motor. Fig. 2 shows a conveyor manufactured to CEE requirements by D. Wickham & Company, Limited, Ware (Herts), with the hydraulic motor mounted inside the framework.

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STAND of Plessey International, Limited, Ilford (Essex), in the British section of this year's Instruments and Measurements Exhibition at Stockholm will be devoted to a display of products and photographs showing how Plessey Nucleonics, Limited, is playing a major role in the design and manufacture of burst fuel element detection systems, health monitors, and in other aspects of nuclear control and instrumentation throughout the world.

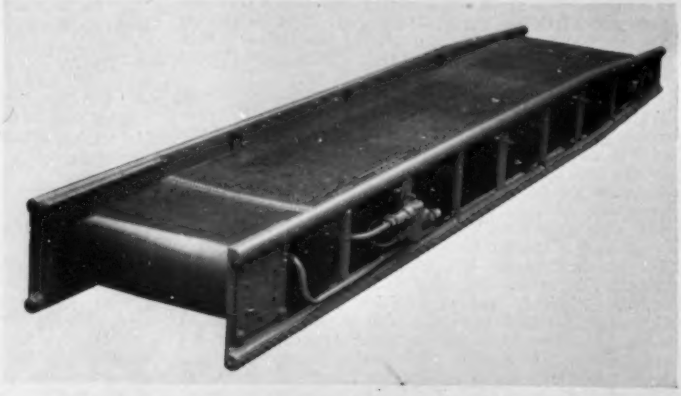


FIG. 2.—HYDRAULICALLY DRIVEN SHORT PORTABLE CONVEYOR.

## *Scottish Branch, NACM*

# FUTURE OF COAL MINING IN SCOTLAND

## Discussion on Mr. R. W. Parker's Address

*The address given by the chairman of the Scottish Divisional Coal Board to members of the Scottish Branch of the National Association of Colliery Managers on April 9 aroused more than average enthusiasm and interest. In his address, which was reported in our June 17 issue (p. 1361), Mr. Parker outlined the basic reasons for the decline in the demand for coal during the past two years and referred to the long-term effect of the new market conditions. Mr. David W. Park, president of the branch, was in the chair during the discussion, which is reported below.*

OPENING the discussion MR. D. W. PARK said they had heard a logical and very reasoned exposition of the changes which had occurred in the industry and a very fair look ahead into the future. One thing that had struck him in the course of Mr. Parker's address was that no great emphasis was laid on the part which management had to play. There was no attempt to drive managers on to greater effort. "I think that is tacit acceptance that management in the Scottish Division, given the chance, carries out its task," he added.

MR. R. F. YOUNG said that on looking at Table 3 it occurred to him that Mr. Parker did not mention the basis of the price he was quoting for coal. Mr. Young assumed it was the delivered price to consumer. If that was so, what effect were transport charges likely to have in the future, assuming we were able to maintain the pithead price sufficiently low to hold the coal/oil ratio? Was there the possibility of any future nationalization of distribution of coal having an effect?

### Future Transport Costs

Replying, MR. PARKER said these figures did include a charge for transport, but that charge was very much "by and large." The information came from official statistical returns, and the compilers stressed they had considerable difficulty in getting truly comparative prices, particularly in the case of coal and oil, where cost of delivery varied tremendously. But they were probably not far wrong. In answer to the second question, he did not think future costs of transport would go against them. The railways, like the Coal Board, were in the throes of modernization. They had not yet managed to reach a point where they were reaping the benefits, but these were coming. Mr. Parker said he saw no reason why the cost of transport of coal should go against them any more than against oil.

When MR. A. B. SANDERSON pointed out that oil came through the ports, and thereafter was mostly handled by motor transport, not much being carried by the railways, MR. PARKER said that the freight on oil started at the oil well, not at the port of discharge. Tanker freights were far below those of 1953. There was quite a large tanker tonnage laid up. All the factors were pushing tanker freights down at present to what many people considered was an abnormally low figure.

A MEMBER said he was very interested to hear the divisional chairman mention the 28-lb. packs of coal. He saw it being priced at 2s. 9d., which was 11s. per cwt. He did not see any grade stamped on the bags and he wondered if the public was being safeguarded.

MR. PARKER said that the prepacked fuel being sold included good doubles from Newcraighall, selling at 2s. 6d. a bag. This was a pilot scheme, and he thought the price would come down over the years. The actual cost of bags at the moment was about 1s. 4d. per cwt.

### A Challenge to Management

MR. J. MILLER expressed the opinion that Table 3 summed up the whole situation in regard to the competition between coal and oil—"if you can produce the coal cheaply enough you don't need to fear oil." That was what was facing the industry today. To produce coal cheaply one must pay attention to o.m.s., and where that meant the introduction of costly machinery that machinery must be made to pay its way. It would take time to replace the capital spent on such machinery; the challenge was up to management. Every item should be looked at in an endeavour to see what could be done to reduce expenditure, no matter what it was.

Mr. Miller, who said he was also very interested in the efficient usage of coal domestically, said he would put it to Mr. Parker that the Coal Board should do something in regard to keeping its own doorstep clean. Officials in the Scottish Division were living as a rule in NCB houses, some of

which were like old castles with old-fashioned fireplaces. The board should carry out a campaign to modernize its own fireplaces in its own houses; that would set a pattern for the general public.

There was laughter when MR. PARKER replied: "Thank you for your very sound suggestion, Mr. Miller. I hope my colleagues will see it carried out."

There was no doubt there had been a feeling of depression in the industry and also among members of the National Association of Colliery Managers, but Mr. Parker's address had more or less dispelled a lot of the doubt, said MR. H. H. WILSON. Even though the divisional output was going to be about 19,000,000 tons, it was still a very big industry. He wanted to ask Mr. Parker two questions. Most of us correlated the demand for coal with the industrial prosperity of the country and Table 1 showed that the index of industrial production in the UK as a whole had risen more rapidly than in Scotland. We tended to associate that with the lack of expansion in the demand for coal. Would Mr. Parker expect an increase in the demand for coal in Scotland if this index went up in proportion to the rise in UK? If the increase in the industrial production from 100 to 111 were related to the demand for coal in England and Wales, the demand had actually gone down during the period of rise in industrial production. The other point of interest was the comparative stability in oil prices. The price of fuel oil had not risen proportionately, yet petrol had remained stable. It seemed that the price of petrol had been stabilized at the expense of fuel oil. If the price of petrol came down would the price of fuel oil go up?

### Working Ahead

Replying, MR. PARKER said the point was that there would be an increase in the demand for energy and the question was, how much would be translated into demand for coal? One was always working a bit ahead, and the general assumption that had been taken was that demand for coal would grow from the present level, but demand for oil would grow faster, and he thought that was probably right. What would happen if the price of petrol went down, say, 6d. a gal.? Two or three things could happen. The oil companies might accept a reduction in their profits. They might adjust prices of the various fraction that come out of a barrel of crude, not necessarily fuel oil, but that was becoming such a big part he thought that a reduction in the price of petrol would have a reflection in some increase in the price of fuel oil.

MR. W. ROWELL said he understood that fuel oil was a direct derivative from crude oil (1.68 ton/barrel) and the more petrol consumed the more fuel oil would be available. Irrespective of what was done as the number of cars on the road continued to grow and there were more diesel locomotives on the railways, etc., it would seem certain that larger tonnages of additional fuel oil would come on the market.

There was another thing he wanted to emphasize to Mr. Parker. When speaking to domestic consumers one sometimes got the impression that after putting in modern appliances for heating apartments they could not get the right solid fuel for them. Mr. Rowell felt that there was not enough liaison or enough propaganda on the part of the board to make sure that people installed a type of plant for which the right fuel could be supplied.

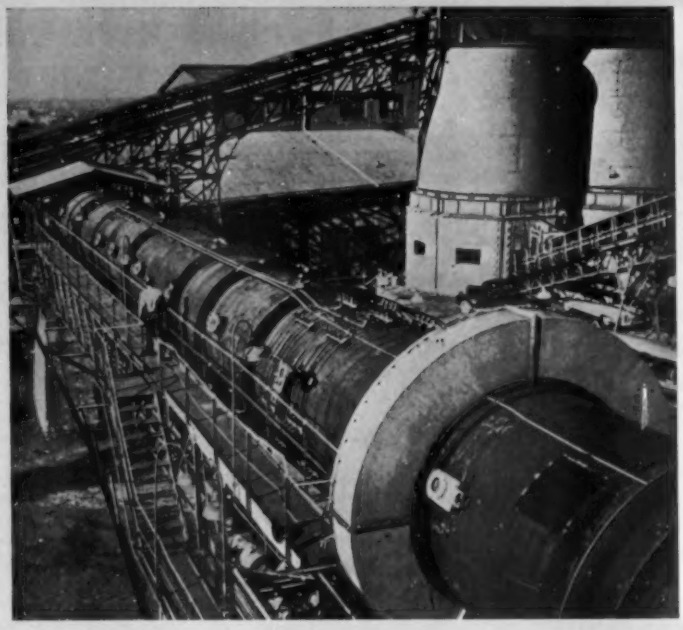
Mr. Rowell was factually correct about the production that came from a barrel of crude, said MR. PARKER, but the point he (Mr. Parker) was trying to make was that a reduction in the price of one component was bound to have a reaction on the other components. There was a possibility of inventions affecting internal combustion engines which might not increase the demand for petrol over the years. There was the Rolls-Royce gas turbine and there were many other possibilities. With regard to domestic appliances, there was need for greater liaison. He continued: "I think the industry must get very much closer to the consumer than we are at the moment. The machinery of distribution is not in the hands of the Coal Board, and that is probably right. The management required is possibly better done by small than large units, but there is room for better liaison and steps are being taken to improve that now."

Mr. Parker had been very kind to management, said MR. D. ARCHIBALD, but in looking forward he wondered if enough attention was being paid to young men coming into the collieries under the DPT scheme. It seemed to him from a parochial level that these young men were being blocked in order to prevent redundancy. Promotion for the young men was out altogether. What effect was that going to have on the long-term policy of the industry? What steps were the board taking to prevent these men drifting away to outside industry? A lot of them were being lost to the industry.

The DIVISIONAL CHAIRMAN said he did not agree with Mr. Archibald that the future was one of blocked promotion for the good young men. The rate of promotion running from 1947, which was artificial to some extent would not continue, however. It would come back into line with the real needs of the industry. While too many young miners were still being lost, they were not losing at the moment any big number of young men from management. In America management was trained to move from function to function in a way that was not usual in this country. It might well be we had something to learn in the traning of young men to give them skill in a function, but also general knowledge that would fit them for other posts, and he thought that would be followed. Therefore, looking to the future, he did not think that the way was blocked.

A vote of thanks to Mr. Parker, proposed by MR. W. DUNCAN, was cordially received.

# *Direct Reduction of Iron Ore*



VIEW OF THE ROTARY KILN AT THE R-N PILOT PLANT IN ALABAMA, USA.

UNDER an arrangement with the R-N Corporation of New York, Head Wrightson & Company, Limited, is now able to engineer and supply throughout the world complete plants using the R-N process for the direct reduction of iron ore and the production of briquettes of a very high iron content. The layout, design, and supply of these plants will be undertaken by Head Wrightson Minerals Engineering, Limited, Sheffield, and a considerable proportion of the equipment will be manufactured in the works of other Head Wrightson subsidiary companies on Tees-side.

The R-N process, so called from the initials of the two companies which have combined to develop it—the Republic Steel Corporation and the National Lead Company—is able to deal effectively with a wide variety of iron ores. It is essentially a very simple process. Iron ore is reduced by being heated with a suitable form of solid carbon in a rotary kiln under carefully controlled conditions, and a high-grade iron is subsequently extracted from the kiln product and finally delivered as briquettes of convenient size and properties for use in a variety of steelmaking processes.

Since the R-N process is not dependent upon the availability of a supply of coking coal, the process will have extensive application especially in those countries where iron ore is found, but such coking coal is not available. Under such conditions the capital and running costs of R-N plants are competitive with other direct reduction processes. In certain conditions, particularly where the demand for pig-iron is small, the process may be competitive with a blast-furnace plant. The product of the R-N process may be fed directly into electric furnaces or open-hearth furnaces.

This new arrangement will enable full use to be made of the accumulated experience of the Head Wrightson group in the handling of plants for the iron and steel industry and for the processing of minerals.

## BISRA Research on Corrosion

EXPERIENCE has shown that poor design of metal objects and structures can lead to serious damage through corrosion. Typical faults that lead to rusting are enclosed areas which form traps for condensed moisture, horizontal surfaces on which water can lie, and design details which cannot be reached for maintenance purposes.

The problem is clearly of practical importance and the Corrosion Committee of the British Iron and Steel Research Association has, therefore, decided to investigate it. The scope of the research will be wide and will relate to structures and assembles of all kinds. Moreover, the term "design" will be liberally interpreted so as to include not only design proper and general layout but also the choice of materials and of protective schemes. It is hoped that a code of recommendations will ultimately be published.

The investigation is of interest to architects, designers, and engineers in many fields. Their specialized knowledge and experience would help the investigators, who would welcome suggestions and comments on their proposals. Communications should be addressed to the Technical Secretary, Corrosion Committee, BISRA, 140, Battersea Park Road, London, S.W.11.

# MECHANIZED COAL OUTPUT IN 1959

STATISTICS of coal output from mechanized faces for the year 1959 (52 weeks ended January 2, 1960) are given in information bulletin 60/217 issued by the production department of the National Coal Board. The following notes indicate the basis on which statistics in Tables 1 and 2 are derived and the manner in which they have been evaluated. All figures are based on pithead tonnage, as distinct from saleable tonnage.

Table 1 gives a summary of mechanized coal-face output by the various types of machine in use in both "longwall" and "other methods" of working during 1959, and comparative figures are also given for 1958.

The term "mechanized output" includes the coal produced by all coal-face machinery which either loads prepared coal or cuts and loads coal simultaneously. It also includes all coal obtained (including that filled by hand) where an armoured flexible conveyor is in use without a separate power loader and where, at the completion of the shift or cycle, there are no props between the

TABLE 1.—*Summary of Mechanized Coal-face output.*

| Type of machine. | No. of machines in use at end of period. | | Pithead coal loaded during period. | | Pithead manshifts per thousand tons (MST) (face) incl. shotfirers. | | Average advance per 24 hr. | | Average advance per machine shift. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1959. | 1958. | 1959. | 1958. | 1959. | 1958. | 1959. | 1958. | 1959. | 1958. |
| | | | Tons. | Tons. | | | Ft. in. | Ft. in. | Ft. in. | Ft. in. |
| *Longwall Methods* | | | | | | | | | | |
| 1.—Anderton shearer loader .. | 311 | 294 | 27,570,632 | 28,121,536 | 145 | 152 | 4 4 | 4 2 | 2 9 | 2 8 |
| 2.—A.B. trepanner .. .. .. | 116 | 72 | 10,183,469 | 4,515,250 | 132 | 144 | 4 11 | 4 3 | 2 9 | 2 4 |
| 3.—Meco-Moore .. .. .. | 104 | 115 | 9,470,141 | 9,999,122 | 144 | 158 | 4 6 | 4 4 | 2 9 | 2 11 |
| 4.—*Plough Types* | | | | | | | | | | |
| A—Plough, rapid .. .. .. | 82 | 50 | 3,983,186 | 2,673,799 | 184 | 188 | 3 6 | 3 3 | 3 0 | 3 0 |
| B—Huwood slicer .. .. | 23 | 24 | 2,086,181 | 1,760,455 | 157 | 189 | 3 5 | 3 4 | 2 0 | 1 11 |
| C—Scraper box .. .. .. | 21 | 15 | 467,051 | 375,120 | 268 | 288 | 3 6 | 3 4 | 3 3 | 3 4 |
| D—Plough, slow .. .. .. | 6 | 10 | 414,264 | 517,156 | 218 | 209 | 2 11 | 2 11 | 2 5 | 2 4 |
| E—M & C stripper .. .. | 3 | 6 | 490,243 | 746,705 | 120 | 127 | 4 9 | 4 10 | 3 7 | 3 2 |
| Totals (4A to 4E) .. .. | 135 | 105 | 7,440,925 | 6,073,235 | 179 | 189 | — | — | — | — |
| 5.—*Cutter-chain Loading** | | | | | | | | | | |
| (i) Conventional conveying .. | 122 | 120 | 3,948,561 | 4,234,434 | 222 | 226 | 3 10 | 3 10 | 3 6 | 3 6 |
| (ii) A.F. conveying .. .. | 15 | 31 | 1,320,883 | 2,082,400 | 200 | 208 | 2 10 | 3 2 | 2 2 | 2 7 |
| Totals (5(i) and 5(ii)) .. .. | 137 | 151 | 5,269,444 | 6,316,834 | 217 | 220 | 3 8 | 3 8 | 3 3 | 3 3 |
| 6.—A.F. conveyor (with prop-free front)† .. .. .. .. | 59 | 49 | 3,796,089 | 3,192,350 | 210 | 222 | — | — | — | — |
| 7.—Huwood hydraulic loader‡ .. | 59 | 28 | 1,811,512 | 615,721 | 179 | 204 | 3 9 | 3 8 | 3 4 | 3 4 |
| 8.—Multi-jib cutter loader .. .. | 42 | 33 | 805,736 | 669,604 | 232 | 281 | 3 10 | 3 6 | 3 4 | 3 0 |
| 9.—Dosco Miner .. .. .. | 8 | 11 | 1,086,007 | 1,071,166 | 109 | 113 | 4 9 | 4 6 | 4 0 | 3 5 |
| 10.—Gloster Getter .. .. .. | 11 | 15 | 782,693 | 1,022,864 | 155 | 168 | 4 1 | 4 0 | 2 2 | 2 1 |
| 11.—Mawco cutter loader .. .. | 2 | — | 54,293 | — | 126 | — | 8 0 | — | 4 2 | — |
| 12.—Huwood mechanical loader§ .. | 3 | 7 | 146,057 | 252,803 | 185 | 186 | 4 6 | 4 2 | 3 7 | 2 10 |
| 13.—Experimental and other applications .. .. .. .. | 20 | 17 | 1,138,642 | 802,119 | 158 | 195 | 4 3 | 3 7 | 2 11 | 2 7 |
| 14.—Totals, longwall methods** (1 to 13) .. .. .. .. | 1,007 | 897 | 69,555,640 | 62,652,604 | 157 | 168 | 4 2 | 4 0 | 2 10 | 2 10 |
| *Other Methods (incl. Room and Pillar)* | | | | | | | | | | |
| 15.—Gathering-arm loaders .. .. | 61 | 63 | 1,813,504 | 1,594,957 | 98 | 102 | — | — | — | — |
| 16.—Joy continuous miner .. .. | 27 | 23 | 935,716 | 813,125 | 47 | 57 | — | — | — | — |
| 17.—Cutter-chain loading .. .. | 8 | 11 | 117,425 | 229,165 | 97 | 106 | — | — | — | — |
| 18.—Duckbill .. .. .. .. | 12 | 22 | 134,874 | 265,355 | 189 | 146 | — | — | — | — |
| 19.—Experimental and other applications .. .. .. .. | 4 | 2 | 44,122 | 65,104 | 92 | 162 | — | — | — | — |
| 20.—Totals, other methods (15 to 19) | 112 | 121 | 3,045,641 | 2,967,706 | 86 | 95 | — | — | — | — |
| Totals, longwall and other methods (items 14 and 20) .. .. .. | 1,119 | 1,018 | 72,601,281 | 65,620,310 | 154 | 165 | — | — | — | — |

* Cutter-chain loading with or without flights includes any adaptation such as Lambton flights where a coal-cutter jib is modified for the purpose of loading.

† These figures exclude power-loaded coal. Armoured flexible conveyors (used in conjunction with power loaders) which numbered 608 at the end of the year 1959, conveyed an additional 50,341,809 tons.

‡ Formally known as Huwood Ski-Hi.

§ Formally known as Huwood loader.

** The figures given as average advance per day and per shift exclude armoured flexible conveyors on a prop-free front (*i.e.*, item 6).

TABLE 2.—*Additional Detail for Longwall Power Loaders.*

| Type of machine. | Average output per 24 hr. | Average output per machine shift. | Average length of face per project. | Average area extracted. | | Weigh'd average seam thickness Extracted. | Average output per 24 hr. | Average output per machine shift. | Average length of face per project. | Average area extracted. | | Weigh'd average seam thickness Extracted. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | per machine shift. | per man-shift. | | | | | per machine shift. | per man-shift. | |
| | 1959. | 1959. | 1959. | 1959. | 1959. | 1959. | 1958. | 1958. | 1958. | 1958. | 1958. | 1958. |
| | Tons. | Tons. | Yd. | Sq. ft. | Sq. ft. | Ft. in. | Tons. | Tons. | Yd. | Sq. ft. | Sq. ft. | Ft. in. |
| Anderton shearer loader .. | 387 | 244 | 185 | 1,546 | 44 | 4 4 | 368 | 238 | 187 | 1,530 | 42 | 4 4 |
| A.B. trepanner .. .. | 438 | 245 | 211 | 1,723 | 53 | 3 9 | 406 | 225 | 218 | 1,563 | 48 | 3 10 |
| Meco-Moore .. .. .. | 382 | 232 | 175 | 1,302 | 39 | 4 10 | 360 | 244 | 162 | 1,412 | 37 | 4 10 |
| Plough, rapid .. .. | 273 | 238 | 164 | 1,567 | 36 | 4 3 | 277 | 258 | 170 | 1,570 | 32 | 4 3 |
| Huwood slicer .. .. | 398 | 235 | 195 | 1,123 | 31 | 5 7 | 358 | 208 | 178 | 1,023 | 26 | 5 7 |
| Scraper box .. .. .. | 108 | 101 | 107 | 1,080 | 40 | 2 10 | 98 | 97 | 102 | 1,073 | 38 | 2 8 |
| Plough, slow .. .. | 231 | 196 | 172 | 1,297 | 30 | 4 7 | 249 | 200 | 179 | 1,265 | 30 | 4 10 |
| M & C stripper .. .. | 430 | 324 | 187 | 1,906 | 49 | 4 6 | 462 | 302 | 186 | 1,695 | 44 | 4 9 |
| *Cutter-chain Loading*: | | | | | | | | | | | | |
| (i) Conventional conveying .. .. | 142 | 128 | 117 | 1,191 | 42 | 3 0 | 141 | 128 | 116 | 1,217 | 42 | 3 0 |
| (ii) A.F. conveying .. | 244 | 184 | 161 | 1,184 | 32 | 4 10 | 253 | 206 | 160 | 1,265 | 30 | 4 6 |
| Totals (i and ii) .. | 158 | 138 | 124 | 1,190 | 40 | 3 6 | 165 | 146 | 125 | 1,228 | 38 | 3 6 |
| Huwood hydraulic loader* | 168 | 147 | 126 | 1,280 | 49 | 3 2 | 151 | 137 | 121 | 1,222 | 44 | 3 1 |
| Multi-jib cutter loader .. | 104 | 92 | 127 | 1,106 | 52 | 2 8 | 75 | 64 | 97 | 873 | 48 | 2 2 |
| Dosco Miner .. .. | 484 | 408 | 145 | 1,755 | 39 | 6 2 | 481 | 363 | 149 | 1,512 | 37 | 6 5 |
| Gloster Getter .. .. | 262 | 136 | 158 | 1,026 | 49 | 3 9 | 239 | 124 | 152 | 931 | 45 | 3 10 |
| Mawco cutter loader .. | 431 | 223 | 143 | 1,702 | 60 | 3 7 | — | — | — | — | — | — |
| Huwood mechanical loader† | 161 | 128 | 187 | 1,289 | 54 | 3 0 | 162 | 112 | 132 | 1,155 | 56 | 2 8 |
| Experimental and other applications .. .. | 287 | 194 | 166 | 1,311 | 43 | 4 4 | 238 | 176 | 146 | 1,171 | 34 | 4 6 |
| Great Britain, average | 316 | 216 | 166 | 1,438 | 43 | 4 3 | 297 | 210 | 162 | 1,393 | 40 | 4 4 |

* Formally known as Huwood Ski-Hi. † Formally known as Huwood loader.

conveyor and the face (*i.e.*, where an armoured flexible conveyor is used on a prop-free front).

TYPE OF MACHINE.—Machines are listed in two groups, namely, for "longwall" and "other methods" (the latter including room and pillar), and a grand total is given for all types of mechanized working. In each group the machines are listed in descending order of output won during the year.

NUMBER OF MACHINES IN USE.—This refers to the number of machines in use at the end of the period.

PITHEAD COAL LOADED.—This is the tonnage won by each class of machine on a pithead basis (*i.e.*, before preparation for the market).

PITHEAD MANSHIFTS PER THOUSAND TONS (MST FACE).—This is the number of manshifts worked at the face for the production of each thousand tons of pithead output.

AVERAGE ADVANCE PER 24 HR. AND PER MACHINE SHIFT.—These figures are derived by dividing the total advance during the year by the total number of days worked and by the total number of machine shifts worked, respectively. They exclude tonnage obtained by armoured flexible conveyors operated on a prop-free front without the use of a separate power loader.

Table 2 gives some additional statistical details for each class of longwall power loader, taking the machines in use at any time during the period. Comparable figures are also given for the year 1958.

AVERAGE OUTPUT PER 24 HR. AND PER MACHINE SHIFT.—These figures are derived by dividing the total output by the total number of days worked and by the total number of shifts worked, respectively. (In many cases, machines work more than one shift per day.)

AVERAGE LENGTH OF FACE PER PROJECT.—The average length of face is derived by dividing the total length of all faces which were worked (including stable holes) during the year by the total number of projects at work during the year.

AVERAGE AREA EXTRACTED PER MACHINE SHIFT AND PER MANSHIFT.—These figures are calculated by multiplying the length of faces, including stable holes, by the advance of each individual project, adding the results and dividing by the total number of machine shifts and by the total manshifts worked, respectively.

WEIGHTED AVERAGE SEAM THICKNESS EXTRACTED.—This is derived by multiplying the tonnage by the seam thickness for each project, adding the results, and then dividing by the total output.

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**Courses at Wigan Mining College**

Two courses, each of 20 lectures, are announced by the Department of Mining and Geology, Wigan and District Mining and Technical College. One, on "Subsidence and Support," will commence on October 4 and will deal, *inter alia*, with causes and prevention of subsidence, pillars of support, law of support and compensation, and relevant geology and surveying. The other course is on "Law" and will commence on October 6. The ownership and development of mineral properties and the concomitant rights of support, compensation, etc., are among the subjects to be covered. The fee for each course is £2 and enrolment forms (to be returned not later than September 19) may be obtained from the Registrar, Wigan and District Mining and Technical College, Library Street, Wigan.

# British Iron and Steel Industry Translation Service

FOLLOWING is a list of some new translations available from the Iron and Steel Institute under its translation service scheme. Translations are all classified by numbers, and these should be quoted on application, which should be addressed to the institute at 4, Grosvenor Gardens, London, S.W.1.

1544A: Discussion to paper on "Tests on the Formation and Precipitation of Deoxidation Products," by E. Plöckinger and M. Wahlster (BISI No. 1544). K. BORN. Stahl u. Eisen, 1960, May 12, pp. 669. £1.

1716: "The Distribution of the Burden within the Blast Furnace and some Possibilities of Exercizing an Influence on It." G. HEYNERT, *et al.* Stahl u. Eisen, 1960, April 14, pp. 473-483. £7 5s.

1733: "Blast-furnace Slags as a Commercial Product." P. KIELSKI. Hutnik (Poland), 1951 (6), pp. 225-227. £2 15s.

1734: "Road Brick Made out of Mansfeld Slag." K. WAGENMANN. Hutnik (Poland), 1951 (6), pp. 229-33, and Technik, 1950 (4), pp. 170-172. £4 10s.

1735: "Influence of Organic Compounds in Ceramic Mixes. A Technological Study of the Fabrication of Porous Materials." W. MANN. Deutsche Keram. Ges. Berichte, 1960, Jan., pp. 11-22. £5.

1740: "Cold-rolled Dynamo Strips." H. SCHLUTER and F. STABLEIN. ETZ-A, 1959, Sept. 1, pp. 576-582. £4 10s.

1747: "Use of Ultrasonics for Seam and Spot Welding." N. A. OL'SHANSKII, *et al.* Avtom. Svarka, 1958 (10), pp. 75-80. £3 5s.

1748: "Creep and Rupture of Tubes Under Internal Pressure." S. N. KATS. Izv. Akad. Nauk S.S.S.R., OTD. Tekh. Nauk, 1957, Oct., pp. 86-89. £2 5s.

1752: "A New-optical Method for the Determination of Non-metallic Inclusions in Steel." T. ERNST and G. KONIG. V.D. Emailfachleute Mitt., 1959, Dec., pp. 93-96. £3.

1783: "Research into the Influence of Addition Elements in Austenitic Steels on the Limit of Elasticity at Room Temperature." H. NOHL, *et al.* Mem. Scientifiques Rev. Met., 1959 (1), pp. 22-29. £4.

1784: "On the Location of Modern Ironworks at the Coast." A. H. INGEN HOUSZ. Stahl u. Eisen, 1960, March 3, pp. 272-276. £2 15s.

1464: "Fundamental Principles on the Digital Presentation and Processing of Data with Special References to Computers." R. WARTMANN. Arch. Eisenhüt, 1959, Aug., pp. 513-518. £3 15s.

1641: "The Sulphur Equilibrium Between Carbon-saturated Hot Metal and Lime-silica Slags." H. SCHNECK, *et al.* Arch. Eisenhüt, 1960, Jan., pp. 11-17. £4 5s.

1693: "Improvement in the Production of Open-hearth Furnaces Heated by Low Calorie Gas by the Injection of Compressed Fluids into Their Gas Burners." L. SEPTIER, *et al.* Rev. Met., 1959, Feb., pp. 179-202, and Centre Doc. Sider, Circ., 1959 (2), pp. 445-460. £6.

1738: "Semi-automatic Manipulator for Closed-die Forging Hammers." M. A. ALBERT. Kuznechno-shtampovochnoe proizvodstvo, 1959 (7), pp. 38-40. £2 15s.

1759: "The Level of Development of the All-basic Open-hearth Furnace in the German Democratic Republic" (slightly abridged). F. RABES and L. ULLSPERGER. Neue Hütte, 1960, April, pp. 224-232. £5 15s.

1760: "New Procedure for Heating Open-hearth Furnaces with Cold Gas and Fuel Oil." I. W. SCHMITT. Stahl u. Eisen, 1960, April 28, pp. 616-619. £3 5s.

1791-1793.—Papers presented at a colloquim on deep drawing held in Paris, May 23-25, 1960:—1791: "The Influence of Various Factors on the Results of the Erichson Test." M. JENTET. £3. 1792: "Ultrasonic Testing of Deep-drawing Sheets." W. LEHFELDT. £3 10s. 1793: "Effect of the Anisotropy of Sheets on their Plastic Deformation Under Uniaxial and Biaxial Stresses." C. CRUSSARD, *et al.* £5 10s.

1803-1804.—Papers presented at the international discussions on long-time behaviour of high-temperature steels held in Düsseldorf, June 24-25, 1960:—1803: "Metallographic Investigations on X 8 CrNiNb 1613 after Creep Tests at 750 deg. C." A. SCHRADER and A. KRISCH. £6 10s. 1804: "Scatter of Creep Strength of Steel X 22 CrMo (W) V 12 1, a Joint Evaluation of German Tests." R. SCHINN. £3 5s.

# Electronic Weigh System for O-H Materials

BY the use of strain gauges bonded to steel support columns the compression caused by loaded rail cars in conjunction with electronic weighing systems, No. 3 open-hearth shop at Indiana Harbour Works of the Inland Steel Company, East Chicago, Ind., obtains accurate measurement of hot metal, scrap, and other charge materials. The systems are said to be simple in design, extremely accurate, inexpensive, and to require little maintenance. An important reason for Inland Steel choosing load cell weighing was that extended accommodation was required, and the new system required no extensive excavation to house conventional weighbridge equipment.

Load cells are not recommended for use at temperatures above 150 deg. F., and while the hot-metal weigh station is not too hot, being ventilated and shielded from heat, the temperature on the charging floor is too high. The company uses 100- and 200-ton hot-metal cars, weigh stations being designed to accommodate both sizes. Depressions ground into the rails help spot the cars for weighing and unloading and keep them still.

Gross weight of the car is noted on the weigh ticket. A control panel inside the station permits the weigher to tilt the car and pour hot metal into the charging ladle. As molten metal drains from the car, the weight reduction is registered continuously on the scale meter. A cursor, mounted on a ring at the periphery of the dial, helps the weigher to stop metal flow at a predetermined weight by reversing the tilt control. The new gross weight of the car and the weight of the metal withdrawn are noted on the weigh ticket. Charging boxes loaded with lime, scrap, or other material are weighed as pan cars approach the furnace.

# IRON AND STEEL TRADE

IMPACT of the holidays on iron and steel production is being kept to the minimum. Stocks are good enough to provide a safeguard against any real shortages developing between now and the end of the month, when the rota of works vacations will be virtually exhausted. Then it will be a case of full steam ahead for the next four months, to implement the promise of a record output in 1960.

### Pig-iron

Activities at the ironfoundries can only be regarded as quiet compared with the demands that are being made on other sections of the industry. Most of the foundries making high-duty castings have good order books, and are calling for substantial quantities of pig-iron, but the light, jobbing, and textile foundries are working below capacity, and the call for high-phosphorus iron is correspondingly restricted. Output of basic pig-iron is in line with the heavy requirements of the steelworks.

### Semi-finished Steel

Many of the re-rolling mills are now closed for annual holidays, which in some cases will terminate at the end of this week, but for the remainder of the month production will be on a varying scale. Most of the re-rollers have good order books, and there is a continued heavy demand for their products, particularly for small bars, light sections, and reinforcing rods. The supply of steel semis is adequate to meet consumption requirements. Stocks held by the re-rollers are generally higher than they have been for some time past, because of the consignments received from oversea and additional tonnages from home steelworks, which could step up deliveries if demands warranted such action.

### Finished Steel

With many of the rolling mills closed down for annual holidays output for the current week is well below normal levels. Demand from consumers is on a somewhat reduced scale, which can be expected in the circumstances, but the mills which are operating are maintaining normal production, due to their heavy forward commitments.

## *World Steel Production At New Peak*

WORLD steel production in the first half of this year was reported by the United States Commerce Department on Tuesday to have been 187,274,000 net tons, which was "the highest half-year output on record." This year was expected to be a record year for world steel production, exceeding substantially the 1959 peak of 317,881,000 tons, the department said. World production, excluding the Chinese mainland and north Korea, was 14,423,000 tons higher than the 1959 first half output of 172,851,000 tons.

All major steel producing countries, except the US, recorded increases. The highest rates of increase were 40 per cent. for Japan, 30 per cent. for Italy, 28 per cent. for the UK, and 23 per cent. for West Germany.

## Machine Tool Makers' Order-book Up

REVIVAL in ordering of machine tools has now reached the stage at which manufacturers have the equivalent of eleven months' work on their hands. Latest figures available show that in May the rate at which orders were received again exceeded the level of output, putting the total order-book at the end of that month up to £83,600,000. This was some £32,000,000 or 62 per cent. more than a year earlier, and brought the industry back to the level of late 1957.

Net new orders in May itself (calculated from the statistics for deliveries and total order-book) were not a record for recent months, but the domestic figure of £10,200,000 was only fractionally less than the average for January to April, and the export total of £2,200,000 was not sufficiently below the recent average to suggest that the rising trend has been reversed.

Deliveries in May—£5,400,000 to the home market and £1,700,000 for export—were not a record, but were only slightly below the average for the first four months of the year. For the whole of the first five months of the year, net new orders totalled £65,000,000, which is 125 per cent. more than the comparable figure of £28,900,000 for last year. Deliveries rose less sharply—by just over 15 per cent. to a total of £37,300,000.

A recovery of this dimension has led to longer delivery dates for some kinds of machinery, but the total order-book includes many types of machinery which take many months to produce, and the contrast between the level of deliveries and the rate of ordering does not imply any general tendency in the industry to run up against the limits of its plant capacity.

## Engineering Deliveries Rise

SINCE October, 1959, the rate of growth in export orders in the engineering industries has been faster than that for home orders. By the closing months of last year net new orders (home and export combined) were increasing more quickly than deliveries, and order-books began to lengthen. The trend continued and in the first five months of this year deliveries were up by almost 10 per cent., but the volume of orders on hand is provisionally estimated to have been 12 per cent. above the level at the beginning of the year.

Seen in the perspective of the past few years, however, the rise is not as spectacular as it would appear. Even at the end of May, orders on hand had only recovered to about the level of the beginning of 1958, when the investment boom was already a year or two past its peak. The extent of the rise in the order-book does not therefore imply that the industries are working to full capacity yet.

# Exports of British Coal

DETAILS of British coal exports and bunker coal shipments in June, and the totals for the first six months of this year and last, are given below.

| From. | Month ended June 30. | Six months ended June 30. | |
|---|---|---|---|
| | 1960. | 1959. | 1960. |
| | Tons. | Tons. | Tons. |
| *Categories.* | | | |
| Anthracite— | | | |
| Large | 4,553 | 23,903 | 35,353 |
| Graded | 23,785 | 115,121 | 119,908 |
| Cleaned smalls | 17,450 | 48,313 | 111,731 |
| All other | 27,580 | 165,228 | 147,880 |
| Steam coal (including household)— | | | |
| Unscreened | 846 | 20,062 | 10,867 |
| Large | 16,062 | 102,617 | 317,834 |
| Graded | 24,562 | 125,645 | 206,832 |
| Cleaned smalls | 61,997 | 132,270 | 552,035 |
| Untreated smalls | 88,924 | 374,687 | 541,930 |
| Other | 11,253 | 128,122 | 83,688 |
| Gas coal— | | | |
| Unscreened | 6,444 | 69,019 | 107,324 |
| Large | — | 1,966 | 11,210 |
| Graded | 23,170 | 132,009 | 199,986 |
| All other | — | 8,564 | 11,859 |
| Coking coal— | | | |
| Cleaned smalls | — | 21,842 | 20,022 |
| Other | 7,454 | 58,937 | 51,227 |
| TOTAL | 314,080 | 1,528,305 | 2,529,686 |
| *Destinations.* | | | |
| Canada | 7,909 | 34,246 | 28,755 |
| Other Commonwealth countries | 553 | 9,974 | 14,269 |
| Eire | 59,331 | 369,414 | 598,022 |
| Finland | 6,158 | 4,985 | 20,738 |
| Sweden | 15,534 | 74,541 | 91,762 |
| Norway | 9,447 | 43,326 | 58,102 |
| Denmark | 80,573 | 380,218 | 766,953 |
| Western Germany | 31,640 | 115,439 | 215,205 |
| Netherlands | 57,066 | 160,394 | 402,842 |
| Belgium | 15,120 | 148,842 | 81,071 |
| France | 10,414 | 126,956 | 85,955 |
| Portugal | 12,871 | 11,513 | 83,120 |
| Italy | 7,420 | 17,534 | 59,254 |
| Argentina | — | 15,737 | 7 |
| Other foreign countries | 44 | 15,186 | 23,631 |
| Fuel taken on board vessels engaged in the foreign trade (including fishing vessels) for their own use— | | | |
| British flag | 23,960 | 318,720 | 204,806 |
| Other flags | 3,283 | 24,081 | 20,583 |

## *Exports of Coke and Patent Fuel*

THE following table gives figures of exports of coke and manufactured fuel from the United Kingdom during June, and the totals for the first six months of this year and last.

| Products. | Month ended June 30. | Six months ended June 30. | |
|---|---|---|---|
| | 1960. | 1959. | 1960. |
| | Tons. | Tons. | Tons. |
| Gas coke | 45,598 | 299,428 | 288,446 |
| Hard coke | 35,237 | 123,344 | 229,643 |
| Breeze | 29,833 | 222,050 | 197,952 |
| Manufactured fuel | 5,247 | 66,771 | 56,123 |
| TOTAL | 115,915 | 711,543 | 772,164 |

# Imports and Exports of Mining Machinery

ACCORDING to Board of Trade returns, mining machinery (other than portable power tools) valued at £112,205 was imported during June, compared with £164,321 in June, 1959. Imports in the first six months of this year were valued at £551,755 against £713,510 in the corresponding period of last year.

The appended table contains figures of export values of mining and well-drilling machinery in June, and values for the first six months of this year and last.

| Destination. | Month ended June 30. | Six months ended June 30. | |
|---|---|---|---|
| | 1960. | 1959. | 1960. |
| | £ | £ | £ |
| Union of South Africa | 34,580 | 246,964 | 292,381 |
| Rhodesia and Nyasaland | 908 | 95,376 | 18,486 |
| India | 86,689 | 855,669 | 608,793 |
| Australia | 23,679 | 138,260 | 205,512 |
| Canada | 16,892 | 105,385 | 180,399 |
| Trinidad | 27,271 | 216,936 | 216,308 |
| Other Commonwealth countries and Eire | 83,090 | 661,747 | 651,481 |
| Netherlands | 16,503 | 136,454 | 104,787 |
| France | 13,243 | 78,001 | 90,292 |
| Venezuela | 11,811 | 121,232 | 62,745 |
| Other foreign countries | 182,450 | 1,998,900 | 1,434,631 |
| TOTALS. | | | |
| Well-drilling machinery— | | | |
| Petroleum | 157,489 | 2,122,614 | 1,375,141 |
| Other | 60,164 | 134,822 | 230,070 |
| Mining machinery (excluding portable power tools)— | | | |
| Coal-cutters, power operated— | | | |
| Complete | 41,262 | 297,054 | 249,004 |
| Parts | 51,776 | 325,797 | 414,728 |
| Conveyors, underground— | | | |
| Complete and parts | 65,517 | 597,988 | 595,007 |
| Winders, power operated— | | | |
| Complete | 2,021 | 82,907 | 113,313 |
| Parts | 17,025 | 141,907 | 113,952 |
| All other | 101,862 | 951,835 | 774,600 |
| TOTAL | 497,116 | 4,654,924 | 3,865,815 |

## HARROGATE CONFERENCE ON SELLING CAPITAL GOODS

CONFERENCE on "Selling Capital Goods" organized by the British Institute of Management will be held at Harrogate from November 16-18. The export of capital goods to under-developed countries, oversea competition, and the effect of the European Common Market on exports will be discussed in the opening paper by Dr. J. G. Mackay, managing director of Francis Shaw & Company, Limited, and chairman of Rustyfa, Limited, while "Overseas Sales and Service" will be dealt with by Mr. A. R. Barker, home sales controller, John Blackwood Hodge & Company, Limited.

Other papers will cover "The Development of Selling Ability" and "Long Term Repayment as an Aid to Selling," by Mr. L. C. Mather, joint general manager, Midland Bank, Limited. Mr. P. L. Johnson, manager, technical services, Ruston & Hornsby, Limited, will read a paper on technical innovations in production, and Mr. J. Broderick, head of the intelligence department, the English Electric Company, Limited, will speak on "Market Survey Work in Light and Heavy Capital Goods."

# THE COAL TRADE

WITH many industrial plants and collieries closed down for the annual holidays, expected quiet conditions have prevailed. In the house coal trade, taking the country as a whole, the volume of sales so far this summer is above that of last year, due to the poorer weather and to a measure of success in inducing customers to lay in stocks. In the industrial sector, the continued expansion in the iron and steel trades is reflected in increased demand for hard coke.

### WEST MIDLANDS

Rather quiet conditions prevail in the house coal trade. Tonnage despatched from the pits prior to the close-down has been arriving at the depots and keeps merchants busy. Production from collieries is running well below the figures obtained last year, and there is still a shortage of the popular coals. First-class quality coals, are, in the main, fairly well absorbed, while large coal and cobbles in the medium price ranges are well short of the market's requirements. House nuts are offered fairly freely and stocks are accumulating at a number of collieries. The demand for premium fuels for the open fire has eased.

The market in smokeless fuels for central-heating purposes is weak in most sections. Best anthracite nuts and beans command a fair amount of support and merchants stock any surplus tonnages. The amount of business being handled in second grade anthracites and boiler nuts is not considerable. Orders for coke are difficult to secure and stocks in hand at producers' works and in merchants' depots are at a very satisfactory level.

The industrial coal position shows little change. Supplies have not been difficult and while industrialists have replenished stocks, in the main they are not yet up to the level they reached in the autumn of 1959. Blast furnace coke is a firm section.

## *Australian Coal for Japan*

BECAUSE of the prospect of large shipments of Australian coal to Japan, the State of New South Wales is considering a £A6,000,000 plan to increase port and shipping facilities. The acting chairman of the Joint Coal Board, Mr. B. Hartnell, has stated that coal storage and unloading facilities will be necessary at Port Kembla, Newcastle, and Balmain to cope with the trade.

The situation has arisen from reports by the State Minister for Mines, Mr. J. B. Simpson, that Japanese steel companies would require 3,000,000 tons of Australian coking coal by 1965.

## BRORA PIT FIRE QUENCHED

FURTHER outbreaks of fire occurred at the Brora Pit, Sutherland, over the weekend, some 90 ft. away from the original fire which had been burning since the previous week. Mine staff and rescue workers from the National Coal Board's rescue station at Cowdenbeath, using high-pressure pumps, managed to flood the pit and by Monday the fires were extinguished.

All the 27 miners who work the privately-owned mine were on holiday at the time of the outbreak. They have been given a further week's leave, but once the approval of the mines inspector has been given they should be able to resume work in that part of the seam unaffected by the fire.

## Consumers' Stocks Down

STOCKS of coal held by consumers are still, on the whole, below the level of last year. Only the coke ovens and iron and steel manufacturers had more coal on the ground at July 23 than they had last year. Domestic coal merchants—faced with the householder's disinclination to stock—are themselves delaying the winter build-up and at July 23 had over 100,000 tons less in stock than at the same time in 1959.

There were 595,100 wage-earners on colliery books on July 23, against 656,600 on July 25, 1959, the numbers engaged at the coal face being 227,100 and 255,800 respectively. Total absenteeism (all workers) in the week ended July 23 was 14.45 per cent. compared with 14.68 per cent. in the week ended July 25, 1959. Output at the face was 4.038 tons and overall 1.360 in the week ended July 23, compared with 3.782 and 1.306 tons in the week ended July 25.

The following table gives (in tons) the output of saleable mined coal by division in the week ended July 30, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

| Division. | Week ended July 30, 1960. | | Week ended August 1, 1959. |
|---|---|---|---|
| | Total output. | Tonnage lost. | Total output. |
| Scottish .. .. | 96,600 | 268,600 | 102,400 |
| Northern (N & C) .. | 151,700 | 91,700 | 195,400 |
| Durham .. .. | 344,500 | 121,600 | 332,700 |
| North-Eastern .. | 475,400 | 354,900 | 447,000 |
| North-Western .. | 142,900 | 133,300 | 155,500 |
| East Midlands .. | 547,800 | 318,800 | 555,600 |
| West Midlands .. | 86,300 | 176,200 | 94,300 |
| South-Western .. | 205,000 | 166,500 | 252,200 |
| South-Eastern .. | — | 31,500 | — |
| Great Britain— | | | |
| Deep-mined coal .. | 2,050,200 | 1,663,100 | 2,135,100 |
| Other deep-mined (including licensed mines) .. | 29,600 | — | 34,100 |
| Open-cast coal .. | 127,300 | — | 148,300 |
| TOTAL .. .. | 2,207,100 | 1,663,100 | 2,317,500 |

## China Buys Scottish Paraffin Coke

PARAFFIN coke from the shale fields of West Lothian is being exported to China and Czechoslovakia. Some 600 tons has been shipped to the Far East and another 700 tons is being loaded for Czechoslovakia. A by-product of the shale oil industry, the coke has never been exported in such quantity before, except to the Swedish steel industry. What the coke is used for in China and Czechoslovakia is not known.

In Britain it is sold both to industry and for domestic use. To improve its household appeal, Scottish Oils, Limited, is establishing a new plant to grade the coke into 2-in. sizes. At present it is sold in bulk and the pieces range from huge lumps to dross.

*Board Changes*

# Metal Cleaning, Limited, to Expand

RECENTLY acquired subsidiary of Castrol, Limited, formerly De-Corrosion Services (Norwest), Limited, but since renamed METAL CLEANING, LIMITED, is to undertake a programme of development. As a first step the board of directors has been reconstituted. Mr. Leonard M. Broadway, deputy chairman and managing director of Castrol, is chairman, with Mr. J. A. V. Watson, a director of Castrol, as deputy chairman and Mr. Arthur Owen as managing director. The other members of the board are Mr. E. B. Bishop, Mr. J. C. Cragg, Mr. George Owen, and Mr. G. J. B. Williams, who is also secretary.

A new factory is to be acquired in the Liverpool area with a capacity at least four times greater than that of the existing plant. The company also intends to establish a chain of depots throughout the country in the major marine and industrial centres.

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BENNIS COMBUSTION, LIMITED—Mr. C. H. Hughes has joined the board.

KEY ENGINEERING COMPANY, LIMITED—Mr. K. A. Skinner has been appointed a director.

LODGE PLUGS, LIMITED—Mr. H. I. Matthey and Mr. J. Walker have resigned from the board.

SUPERHEATER COMPANY, LIMITED—Mr. K. E. Merefield and Mr. W. B. Sallitt have joined the board.

WOLVERHAMPTON METAL COMPANY, LIMITED—Mr. D. P. C. Neave has been appointed vice-chairman.

A. W. CHAPMAN, LIMITED—Mr. W. A. Wood, commercial manager, and Mr. R. L. Harrison, sales manager, have joined the board.

SIDNEY RAINES, LIMITED—Mr. George Drysdale has joined the board and Mr. W. E. Hopkin has joined that of Raines (H & V), Limited.

METAL AGENCIES COMPANY, LIMITED—Mr. B. G. S. Donald has been appointed a director with effect from August 15.

OCTAVIUS ATKINSON & SONS, LIMITED—Mr. R. Embleton, Mr. D. F. Shaw, and Mr. F. G. Woodhead have been appointed directors.

TELEGRAPH CONDENSER COMPANY, LIMITED—Mr. R. C. Sprague has been elected a director and Mr. J. K. Spague has been nominated as an alternate director to him.

JAMES GORDON & COMPANY, LIMITED—Mr. Ralph Hussey, who has joined the board, was for 34 years with Elliott Bros. (London), Limited, also associates of the Elliott-Automation group.

WELLMAN SMITH OWEN ENGINEERING CORPORATION, LIMITED—Mr. D. L. Campbell, managing director (sales) of Metallurgical Equipment Export Company, Limited, has been appointed to the board.

UNITED COKE & CHEMICALS COMPANY, LIMITED, branch of the United Steel Companies, Limited—Mr. D. R. Jones, general manager of the United Steel ore mining branch, has been appointed to the board.

NEWMAN, HENDER & COMPANY, LIMITED—Mr. S. H. W. Smith has been appointed to the board in place of Maj. I. C. V. Smith, who has relinquished his directorship. Mr. F. V. Smith has been appointed an additional director.

INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED—Mr. William K. Whiteford, president of the Gulf Oil Corporation, US, has joined the board. He has been a member of the advisory committee of the company since February.

BALFOUR BEATTY (OVERSEAS), LIMITED—Mr. Thomas Ingledow, president of International Power & Engineering Consultants, Limited, Vancouver, has been appointed a director of the company—a subsidiary of the Power Securities Corporation, Limited.

SUTCLIFFE PLANT HIRE, LIMITED—Mr. H. Streets, who has joined the board, is also a director of Richard Sutcliffe, Limited, Horbury. He was technical director at Horbury for many years before being appointed projects director four years ago.

W. WESSON & COMPANY, LIMITED—Following the denationalization of the company, Mr. P. J. Wesson becomes deputy-chairman and joint managing director. Mr. L. J. Wesson remains chairman and joint managing director with him. Mr. Vivian Royston has joined the board.

UNITED STEEL COMPANIES, LIMITED—Mr. H. Darnell has joined the board of the Workington Iron & Steel Company, branch of United Steel, and Mr. D. R. Ward Jones has been appointed a director of the United Coke & Chemicals Company, Limited, also a branch of United Steel.

F. PERKINS, LIMITED—Mr. G. E. Smith, director of production for the group, has been appointed assistant managing director of the Hamworthy Engineering Company, Limited. Mr. T. H. R. Perkins, managing director of Perkins Engines, Limited, has been appointed temporarily as director of production and Mr. J. M. Collins, export sales manager of Perkins Engines, is to become acting director of marketing for the group.

RHODES & HALMSHAW, LIMITED—Mr. K. E. Walker, director in charge of the engineering division of Newton, Chambers & Company, Limited, has been appointed chairman. Mr. Frank Whitehouse, general works manager of Newton, Chambers' engineering division, has joined the board. Mr. R. J. V. Wheeler, secretary of Newton, Chambers, has been appointed secretary of Rhodes & Halmshaw, wihich was recently bought by Newton, Chambers.

WOODALL-DUCKHAM CONSTRUCTION COMPANY, LIMITED—The following board changes have been made with effect from August 1:—Mr. J. Simpson designated deputy chairman (group) with overall responsibilities regarding the growing number of subsidiary companies; Mr. E. N. Wenborn appointed vice-chairman with particular responsibilities relating to the company as a contracting unit; Mr. C. D. Muntz appointed a joint managing director. The following members of the staff have joined the board:—Mr. A. F. Cottrell as director-in-charge, operating department; Mr. H. E. Dyble as director-in-charge, construction department, and Mr. R. O. Richards as director-in-charge, design and development department.

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## SHIPYARD SEEKS REDUCTION IN TIME WASTED

CIRCULAR distributed among employees of Vickers-Armstrongs (Shipbuilders), Limited, signed by the general manager, Mr. R. J. W. Rudkin, warns that disciplinary action will be taken against men abusing the tea-break. "A drink of tea from a vacuum flask on the job is permitted, but action will be taken against those abusing this privilege or consuming food during working hours," it states.

The warning is chiefly aimed at men stopping work and leaving ships about 10-15 minutes early so that they can be in a good position for a "get away" when buzzers blow.

# COMPANY NEWS

CABLES INVESTMENT TRUST, LIMITED—Net earnings for the year ended June 30, were £523,641 (£440,843) and the dividend is maintained at 2s. per £1 unit.

NEWMAN, HENDER & COMPANY, LIMITED—Final dividend of 10 per cent. for the year ended April 2, 1960, makes 12½ (same) per cent. The profit was £380,672 (£302,297), before tax of £189,700 (£162,000).

HOLMAN BROS., LIMITED, mining, quarrying, pneumatic plant specialists, etc., of Camborne (Cornwall)—Group profit for the year to March 31, 1960, rose to £321,367 (£244,369), before tax of £161,940 (£124,983).

CAMBRIDGE INSTRUMENT COMPANY, LIMITED—The offer to shareholders of Electronic Instruments, Limited, has had a 100 per cent. acceptance and the merger between the two companies has been completed.

INBUCON, LIMITED—management and industrial consultants, of London, W.C.2—Group net profit for the year ended March 31, 1960, was £96,182 (£99,291) and the dividend is raised from 20 to 22½ per cent.

FIRTH BROWN TOOLS, LIMITED—Sales at home and abroad continue on a most active basis, states the chairman, Mr. E. Mensforth. Group net profit in the year ended March 31, 1960, was £255,344 (£174,498), and the dividend rose to 12 (9) per cent.

POWER-GAS CORPORATION, LIMITED—The offer made by Davy-United, Limited, to acquire the issued ordinary capital has been accepted by the holders of over 90 per cent. of the capital. It is proposed in due course to compulsorily acquire the remaining shares.

HARDYPICK, LIMITED—Notification of an intention to make an offer for the £30,000 preference and £70,000 ordinary capital has been received. A further communication will be sent as soon as practical, and pending this, holders are advised not to dispose of their shares.

FIFE COAL COMPANY, LIMITED (in members' voluntary liquidation)—The final reports of the liquidator were presented to shareholders on Monday and, together with the accounts, formally accepted. Three months must now elapse before the final seal is set on the liquidation.

MIDLAND TAR DISTILLERS, LIMITED—A jointly owned company has been formed with the Schenectady Varnish Company, Incorporated, of New York, to make and sell Schenectady products in the UK. The company is also to expand its activities by making chemical derivatives obtained from tar distilling.

SOUTH WALES SWITCHGEAR, LIMITED—The minority interest in Treforest Electrical Services, Limited, has been acquired so that it now becomes a wholly-owned subsidiary. It is intended that Treforest shall operate as a division of the company, which is a subsidiary of Aberdare Holdings, Limited.

HARGREAVES (LEEDS), LIMITED—The 500,000 £1 ordinary shares to be offered to stockholders on a one-for-two rights basis will be issued at 40s. each. The directors expect to recommend for the year ending March 31, 1961, dividends totalling not less than 15 per cent. on the increased capital.

WARSOP POWER TOOLS, LIMITED—Negotiations have been completed for the purchase of all the issued share capital of Vibrated Concrete Construction Company, Limited, in association with the raising of £20,000 additional working capital by the issue of 200,000 ordinary 2s. shares for cash at par.

CALOR GAS HOLDING COMPANY, LIMITED—Final dividend of 10 per cent. for the year ended March 31, 1960, makes 15 per cent., compared with the equivalent 12½ per cent. for 1958-59, allowing for the one-for-five scrip issue. Profits rose to a record £1,528,799 (£1,414,683), before tax of £341,074 (£414,975).

JOHN FOLKES (LYE FORGE), LIMITED, forgemasters and general engineers, of Stourbridge (Worcs)—During the year ended March 31, 1960, net profit was £146,622 (£141,792), after tax of £110,765 (£129,808). The dividend is raised to 16 (15) per cent., the minimum forecast at the time of the 100 per cent. scrip issue.

G. BRADY & COMPANY, LIMITED, manufacturers of rolling shutters and lifts, of Manchester—The terms of the acquisition of T. Pickett & Sons (Engineers), Limited, are 41,000 of the company's "A" 5s. ordinary shares in exchange for the capital of Pickett and the freehold property at 7-10, Elm Street, Cardiff, the registered office of Pickett.

WILLIAM JACKS & COMPANY, LIMITED, metal merchants, importers and exporters, of London, E.C.2.—Final dividend of 4d. is being paid, making 6d. less tax per 5s. share, and 2d. per share, not taxable, from capital profits for 1959, against the same equivalent rate for 1958. Group profit was £268,854 (£358,292) before tax of £160,000 (£235,000).

J. H. PECK & COMPANY, LIMITED—The acquisition by the subsidiary, L. H. Brown & Son, Limited, of all the issued share capital of F. & C. Leach, Limited, was for £88,000 cash. It is considered by the directors that the company, which hires plant to building and public works contractors, will prove a useful addition to the group and it is felt that there is considerable scope for further expansion.

DUBILIER CONDENSER COMPANY (1925), LIMITED—Production, sales, and the value of orders for the first three months of the current financial year are higher than for the corresponding period of last year, states the chairman, Mr. F. H. McCrea. Sales of products in the electronic industry and for industrial applications are increasing and, assuming trading conditions remain stable, results for the current year should be satisfactory, he states.

BRITISH OXYGEN COMPANY, LIMITED—Interim payment on the £17,047,166 ordinary capital is raised from 4 to 6 per cent. on account of the year ending September 30, 1960. The previous year's total was 10 per cent. Sales in the first six months of the year to March 31, 1960, rose to £29,500,000—an increase of £3,000,000 on the corresponding period of 1958-59. Group net profit was £2,219,000 (£1,851,000), after tax of £2,400,000 (£2,255,000).

BANISTER, WALTON & COMPANY, LIMITED, structural steel engineers and stockholders, of Manchester—The order-book, and that of the subsidiary, F. Bradford & Company, Limited, shows an improvement compared with this time last year, states Mr. Arthur D. Dean, the chairman. The liquid position is strong "so we can take advantage of any opportunity which may occur for further improvement in our works or for extension of business," he declares.

WEARDALE LEAD COMPANY, LIMITED—An interim report by Col. H. H. Peile, the chairman, states that the expected improvement in shares has materialized—by some 50 per cent. metallurgical grade fluorspar and 25 per cent. in refined grade, as compared with the corresponding period last year. Cash resources have increased correspondingly. The board has decided to install new plant to replace the existing gravity mill at an estimated cost of £30,000.

ENFIELD ROLLING MILLS, LIMITED—Net proceeds of

the issue of £1,750,000 6 per cent. unsecured loan stock, 1980-85, are estimated at £1,620,000 and will be used to reduce the company's overdraft with its bankers. The group's trading operations during the current year are satisfactory, state the directors. Net profit for the year ended December 31, 1959, before taxation, etc., was £1,743,915—the average net profit of the group for the previous five years being £1,549,488.

ELLIOTT-AUTOMATION, LIMITED—Terms of the share exchange offer for the £150,000 preference and £985,600 ordinary capital of The Rheostatic Company, Limited, are: for every 10 Rheostatic ordinary units of 4s. Elliott is offering three 7 per cent. cumulative preference shares of £1 and seven ordinary shares of 5s.; for every 10 Rheostatic 6 per cent. cumulative preference of 10s. Elliott is offering three 7 per cent. cumulative preference of £1 and two 5½ per cent. cumulative preference of £1.

GENERAL CABLE MANUFACTURING COMPANY, LIMITED—the cable price war may have already cost the industry a sum approaching £10,000,000, states the chairman, Mr. C. W. R. Pantlin. Price increases have been announced in recent months, but, he adds, owing to long-term contracts and other circumstances, such increases have not yet become effective except to a minor degree. In the six months ended March 31, 1960, the company and its subsidiary incurred a substantial trading loss.

WALTER SOMERS, LIMITED, forgemasters, engineers, and die block manufacturers, of Halesowen, near Birmingham—Mr. F. J. Somers, the chairman, says that the industry has reached a stage where it is no longer possible to sustain profit margins by increasing prices. The current year, he states, will be a difficult one. Competition from the Continent will be severe and orders will have to be taken at low prices. In the year ended March 31, 1960, net profit rose from £93,931 to £107,464, after tax of £48,963 (£109,325). The dividend is reduced from 4d. to 3d. per 2s. share.

FIRTH CLEVELAND, LIMITED—At the annual general meeting of the group, Mr. C. W. Hayward, the chairman, said that order-books were in a very healthy state. All companies reported increases in incoming orders during the first six months of the financial year, compared with the corresponding period of the previous year. Exports of Simmonds Aerocessories, Limited, had increased by 40 per cent. Group turnover was fully up to expectations and the chairman expected the group to reach the £35,000,000 forecast in his statement.

BRADLEY & COMPANY, LIMITED, engineers, foundrymen, and galvanizers, of Bilston (Staffs)—Reviewing the 15 months to March 31, the chairman, Mr. T. L. Perry, says that to properly co-ordinate the new group activities—following the acquisition of the company in August by W. P. Butterfield, Limited—Butterfield should become purely a holding company. To this end a capital reconstruction of both companies is recommended. Group net profit for the period was £201,219, compared with £102,226 for the previous year.

ENGINEERING COMPONENTS, LIMITED—Profits for the first six months of 1960 show a substantial increase over those for the corresponding period of last year. The directors expect to pay an interim dividend of 7½ per cent. in September and a final of 12½ per cent. in March, 1961, on the ordinary capital as increased by the recently proposed one-for-two rights issue at par. The new issue will finance the purchase of the freehold of the Abergavenny factory and the purchase of seven acres of land adjoining for building new factory premises.

*The Scrap Markets*

# Half-year Imports Cost More Than £1,000,000

IN the first six months of this year imports of iron and steel scrap and waste, at 72,653 tons, were more than 30 times the tonnage imported during the same period of 1959, when a mere 2,002 tons arrived at British ports. The value of these imports is £1,153,513, compared with £57,052 in the first six months of 1959.

A strong demand for heavy melting scrap for steelworks continues. Where holidays have intervened most works have been open to receive supplies, but where scrap producers have closed down for holidays, too, these have not been readily forthcoming.

**Lancashire**—Reasonably good supplies of machinery metal and other descriptions of iron and steel scrap are available and users are mostly able to cover requirements without difficulty. Regular tonnages of steel-melting sorts are being taken up by the works, and there has been a reasonably steady movement of cast scrap to the foundries, which seem still to be content to meet early needs, without adding significant quantities to reserves.

**Scotland**—The market is slowly gathering momentum after the annual holiday break. Although most steelworks did not close to traffic during the holiday period, scrap producers were not operating and the tonnage of steelmaking scrap dropped to a mere trickle. With the resumption of production this week, it is hoped that output of scrap will begin to flow in increasing volume.

The blast furnaces remained open to traffic during the holiday period and any small quantities of cast-iron borings arising were disposed of easily.

The foundry position continues to be erratic, as quite a number are on holiday and will not resume production until about the middle of the month.

**North-East Coast**—Scrapyards are being kept very busy primarily in meeting the strong demands of steelworks for maximum tonnages of Nos. 1 and 2 grades of heavy melting scrap. The collection and processing of the material, of which good stocks are being maintained at works against emergencies, represents a major task, and the scrap arising from local sources is being supplemented by increasing imports into the Tees by coastwise vessels from south country ports and also from the Continent. Scrap imports during the last month for which statistics have been issued are almost 10 times those of a year ago, and of the total of nearly 20,000 tons imported more than 12,000 tons was unloaded from coastwise ships.

The steel foundries are absorbing good quantities of short heavy steel scrap, and machinery scrap also commands a ready market. Due to the subdued state of business at ironfoundries, local outlets provide only a moderate market for cast-iron scrap, but a good deal is being sent to the Lincolnshire iron and steel area. There is a strong demand for baled scrap from blast furnaces.

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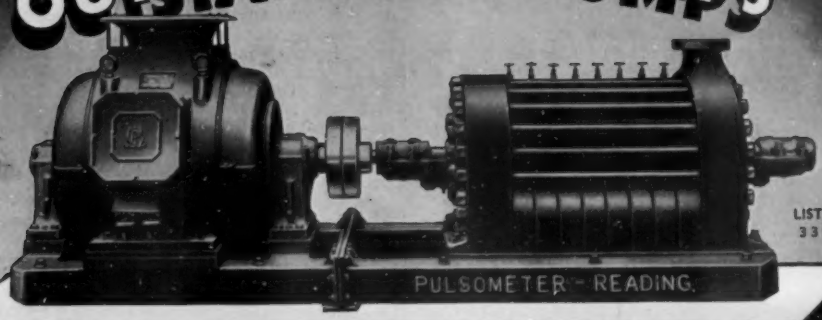
NO. 1 BLAST-FURNACE of the Consett Iron Company, Limited, has been relit after being out of commission for several months for repairs.

# Pulsometer Engineering Co., Ltd.

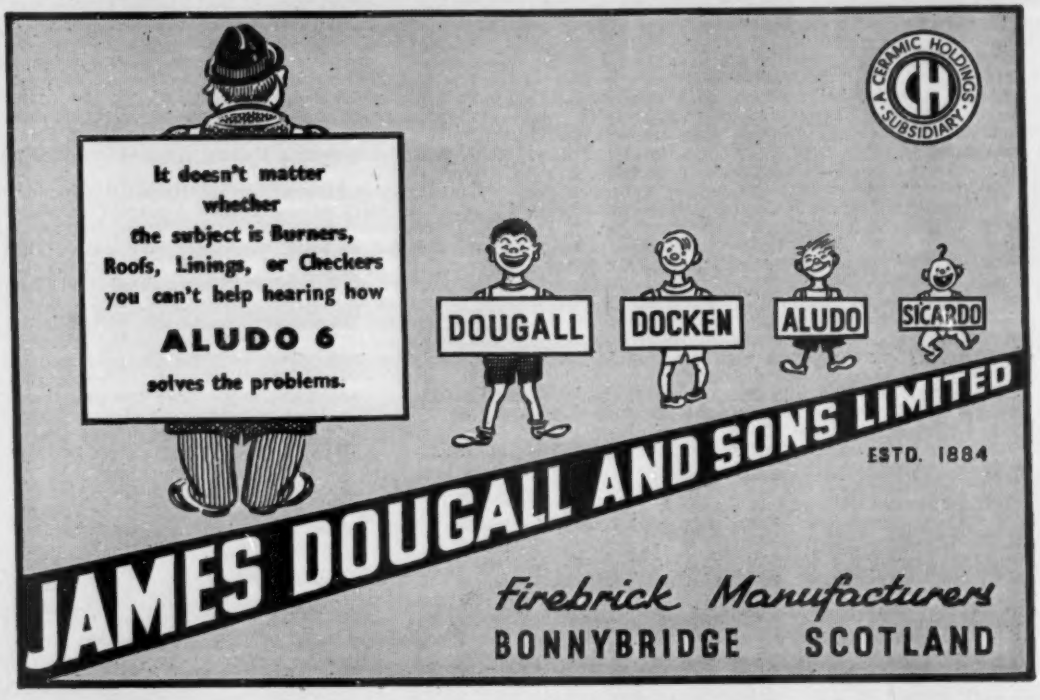
NINE ELMS IRONWORKS READING, BUILDERS OF

## OUTSTANDING PUMPS




FOR ALL DUTIES INCLUDING HIGH LIFT PUMPS FOR MINES
UP TO 3,600 FEET

OFFICES IN: LONDON, BIRMINGHAM, CARDIFF, GLASGOW, LEEDS, MANCHESTER, NEWCASTLE-ON-TYNE



# NEWS IN BRIEF

PORT of Hartlepool (Co. Durham) unloaded a record total of 45,000 tons of iron ore last week.

PLANS for the new factory and offices of Ductile Steels, Limited, have been approved by Daventry (Northants) Town Council.

DESIGNS AND MANUFACTURING RIGHTS of Milness roller shutters have been acquired by Holts Shutters, Limited, Bradford, from Hall Engineering, Limited, Liverpool.

THE BATTLESHIP Vanguard, which will shortly be towed to the Clyde for scrapping, is to be broken up by Shipbreaking Industries, Limited, a company in the Metal Industries Group.

EXPORTS of coal, coke, and patent fuel through the port of Hull in the four weeks ended June 17, rose sharply from 16,851 tons to 32,819 tons. Petroleum exports for the same period fell.

FIRST SHIPMENTS of Banka tin ingots smelted in Penang from Indonesian ores arrived at Antwerp at the weekend. The smelting of Indonesian ores in Penang constitutes a new development.

THE TWO JAPANESE steel producers, Yawata and Fuji, have received an order from India for 63,575 metric tons of rails. This is the second largest foreign order received by the Japanese producers.

LOAN OF US $3,000,000 has been granted by the International Finance Corporation to the Venezuelan steel concern, Siderurgica Venezolana, SA, for the extension and modernization of its plant.

FIRST ISSUE of the staff magazine of the Central Electricity Board, Power News, contains an article on the dangers of atomic radiation and a report on the slackening of the country's atomic power programme.

LOADING of the largest cargo of coal ever to leave the Humber has been achieved in record time at Immingham. The Norwegian vessel Providence took 17,445 tons of coal on board at the new conveyor in 30 hrs. 32 mins.—a rate of 575 tons an hour.

MORE THAN 500 boilermakers at the Renfrew works of Babcock & Wilcox, Limited, stopped work two hours earlier on Monday in the hope that work would be created for some of the 50 men paid off last Friday. They are to continue this action each Monday.

NEW INSTALLATION DIVISION has been formed by Causeway Reinforcement Company, Limited, Northfleet (Kent). Under the management of Mr. J. D. Abernethy, it will instal Hexmetal retaining armour, studs, and reinforcement mesh for refractory linings.

THE NATIONAL COAL BOARD'S first solid fuel retail sales and advisory centre in the East Midlands Division was opened in Regent Street, one of the main shopping areas of Mansfield (Notts), recently. The opening ceremony was performed by Mr. Rex Ringham, chairman of the division.

COMMITTEE OF AMERICAN STEAMSHIP LINES, representing 15 US shipping lines, reports that world-wide shipbuilding activities are still declining, but that the rate of decline last year was less than in 1958. British shipyards were paring profits to obtain contracts and some ships were being built at a loss.

BECAUSE MANY DISTRICTS in Scotland have no gas, the Department of Fuel Technology and Chemical Engineering, Sheffield University, acting upon a suggestion from the Clean Air Council for Scotland, has devised an electrical smokeless appliance to light coke. It is to be marketed in the near future.

THE MINING ORGANISATIONS within the European Coal and Steel Community area have requested a sum of $5,000,000 credit from the High Authority of the ECSC for use in the furtherance of coal consumption. The money would be spent primarily on the propagation of modern coal and coke heating units.

IN THE FIRST QUARTER of 1959 exports of consumer goods from the US to Britain rose to $289,000,000 (£103,200,000), compared with $179,000,000 (£64,000,000) in the corresponding period of 1959. The UK liberalization of dollar import curbs was primarily responsible for the sharp increase.

DR. JAGAN, Minister of Trade and Industry in the Government of British Guiana, was due in London this week to negotiate a Colonial Office loan for the purchase of the Demerara Electric Company, a Canadian-controlled company in Guiana whose value is estimated at between £1,000,000 and £2,000,000.

APPLICATION by the Nassington-Barrowden Mining Company, Limited, to mine ironstone over 1,017 acres in the Tixover area has been rejected by Ketton (Lincs) Rural District Council. The council's surveyor, Mr. L. J. Roll, said that a land-grab appeared to be in progress between the various ironstone companies.

STEEL PRODUCTION in the United States this week is estimated by the American Iron and Steel Institute at 1,570,000 tons, compared with 1,520,000 tons (revised) last week and 318,000 tons in the corresponding week of last year. In terms of January 1 capacity of 148,570,970 net tons, this week's output is 55.1 per cent. compared with last week's 53.3 per cent. (revised).

"STONE INTO STEEL," the 35-minute colour film made for the United Steel Companies, Limited, Sheffield, was the winner among more than 200 documentary films entered at the Venice Film Festival which ended on Saturday. The film features the Appleby-Frodingham Steel Company, branch of United Steel Companies.

NEARLY 2,000 men in the shipbuilding and repairing industry at Grimsby have been granted a wage increase. Skilled workers are to receive 3d. an hour more and semi-skilled and unskilled workers, 2½d. an hour more. This follows a claim for an increase of 8d. an hour made by the Confederation of Shipbuilding and Engineering Unions to the Grimsby Ship Repairers' Association in June.

BANK HOLIDAY MONDAY for Mr. Harold B. Crombie, assistant secretary of the Cutlers' Company in Sheffield, meant a two-hour wait in the Cutlers' Hall for a meeting which he knew would not take place. The meeting has to be called for the first Monday in August under an Act of Parliament dated 1791, but not since 1838 has anyone attended.

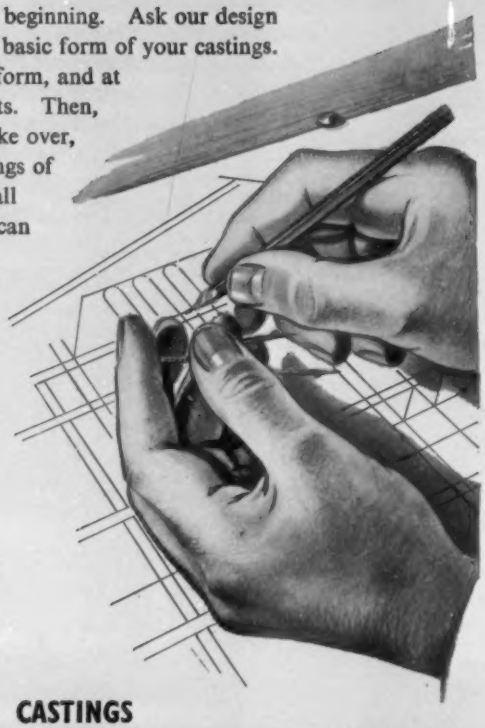
THE BELGIAN GOVERNMENT announces that it is to stop subsidies to the national coal mining industry completely by 1963. Since 1952 the Government has spent a total of 45,000,000,000 Belgian francs on the subsidizing of uneconomic pits. Over the past three years pits with a total annual production capacity of 7,400,000 metric tons are stated to have been closed in Belgium, while a further 2,700,000 metric tons capacity is planned to be closed in the current year.

BECAUSE OF greatly increased sales, Yates Plant, Limited, specialists in mechanized welding shop plant, has moved its design, development, and sales sections from London to Hebburn-on-Tyne, where all its equipment is manufactured. Its address is now:—Yates Plant, Limited, Bedewell Works, Hebburn-on-Tyne (Co. Durham). Mr. H. Yates, who remains with the company as a consultant, it to make an extended business trip to Australia and New Zealand in October.

ARE YOU

# re-designing?

Start right at the beginning. Ask our design engineers to reconsider the basic form of your castings. Very often they can improve the structural form, and at the same time reduce complexity and cut costs. Then, when our metallurgists and foundry engineers take over, you'll be getting cheaper, more sound castings of unequalled quality and accuracy. This is what we call technical teamwork and we're proud of it. It can tackle *all* your casting problems and *solve* them.



**CASTINGS FROM A FEW OUNCES TO 10 TONS**

in phosphor-bronze, gun-metal, aluminium-bronze, manganese-bronze, and light alloys. Precision machined bushes and bearings. Specialists in high-tensile aluminium-bronze castings, centrifugal-cast wheel-blanks, shell moulded castings, and chill cast rods and tubes. Continuous cast phosphor-bronze bars up to 12 foot lengths.

BIRSO TRADE MARK BN

**NON-FERROUS CASTINGS**

**HIGH-DUTY IRON CASTINGS · PRECISION MACHINED BUSHES & BEARINGS**

**T. M. BIRKETT, BILLINGTON & NEWTON LIMITED**

HANLEY AND LONGPORT, STOKE-ON-TRENT, ENGLAND

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# CURRENT PRICES OF IRON AND STEEL

*(Delivered, unless otherwise stated)*
August 4, 1960

## PIG-IRON

**Foundry and Forge Iron.**—No. 3 iron, Class 2, Middlesbrough, £21 6s.; Birmingham, £20 18s. 3d., 10-ton lots or over.

**Low-phosphorus Iron.**—Over 0·10% to 0·40% P, 10-ton lots or over, £23 5s., delivered Birmingham, £23 10s., delivered Grangemouth.

**Basic Pig-iron.**—Delivered in Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics, 10-ton lots or over, £20 3s.

**Hematite.**—Si up to 2%, S & P 0·03-0·05%: N.-E. (local iron), £23 19s.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 7s. 6d.; Birmingham, £25 14s.; Wales (Welsh iron), £23 19s., 10-ton lots or over in each case.

**Refined.**—Cylinder and refined irons, South Zone £25 9s., North Zone £25 6s. 6d. Refined malleable, max. 0·10% P. South Zone £26 9s., North Zone £26 6s. 6d.

## MANUFACTURED IRON

*(Bar basis, 2½ in. to ¾ in.)*

CROWN IRON: England and Wales (Zone 1), £48 10s.; Scotland, £48 5s.; Ireland, f.o.q. Belfast, £50 7s. 6d.; all other Northern Ireland ports, £50 10s., f.o.q. Cable iron, £1 extra.

## SEMI-FINISHED STEEL

**Re-rolling Billets, Blooms, and Slabs.**—BASIC: Soft, u.t., 100 tons and over, £31 15s. 6d.; tested, 0·08-0·33% C, 5 to 35 tons, £33 15s. 6d.; hard (0·41-0·60% C), under 10 tons, £34 17s.; silico-manganese, under 10 tons, £43 16s. 6d.; free-cutting steel up to 0·25% C, under 10 tons, £36 14s. 6d. SIEMENS-MARTIN ACID (under 10 tons): Up to 0·25% C, £41 1s.; silico-manganese, £44 4s.

**Billets, Blooms, and Slabs for Forging and Stamping.**—Lots of under 10 tons. Basic, soft, up to 0·33% C, £38 10s.; basic, hard, over 0·41 up to 0·60% C, £39 12s. 6d.; acid, up to 0·25% C, £43 4s.; acid silico-manganese, £46 7s.

**Alloy Steel** (5 tons to under 10 tons).—BILLETS, 3 in., up to and including 10 in., for re-rolling, 0·6/1% Ni, £47.; Ni 2·75/3·75%, Cr 0·5/1·10%, £73 17s.; Ni 2·75/3·75%, Cr 0·5/1·3%, Mo 0·2/0·65%, £84 7s. BARS: 1 in. dia. and up, nickel, £67 17s.; nickel-chrome, £98 11s.; nickel-chrome-molybdenum, £111 4s.

**Other Semi-products, etc.**—Forging ingots, up to 0·60% C, £31 12s. 6d. f.o.t.; tube billets, under 10 tons, £40 10s.; shell steel billets for direct forging up to and including 0·33% C, 100 tons and over, £37 15s.; tin bars and sheet bars, 50 tons and over, £32 10s. Wire rods, 3g. to 4g. (all areas except Birmingham, Scotland, Southern Joint Area, and Northern Ireland): Soft basic, under 50 tons, £41 2s.; hard basic, under 10 tons, £44 8s.; free-cutting, up to 0·25% C, under 10 tons, £46 12s.; acid, up to 0·75% C, under 10 tons, £54 14s. 6d. Stainless steel billets, 3 in. and over, 5 tons to under 10 tons, Austenitic, £229 10s.; martensitic, £141 10s.

## FINISHED STEEL

**Heavy Products** (1 ton to under 10 tons).—Mild-steel plates, ordinary qualities, N.-E. Coast and Northern Joint Areas and Central Scotland, £41 12s.; medium plates, all areas of England and Wales, £45 1s. 6d.; boiler plates, N.-E. Coast and Northern Joint Areas and Central Scotland, £44 2s.; floor plates, N.-E. Coast, £43 1s. Sections (N.-E. Coast, Midland, and Northern Joint Areas, and Central Scotland): Angles, £38 16s. 6d.; bars (rounds and squares), £41 6s. 6d.; flats, £39 1s. 6d.; joists, £38 12s. 6d.

**Rolled and Re-rolled Steel Products.**—N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over: Angles and tees, 4 in. and under, £40 18s. Channels, 3-in. web and under, £40 18s. Flats, 5 in. wide and under, and rounds and squares, under 3 in.: Untested soft basic, £39 1s.; free-cutting, £45 1s. 6d.; hard basic, £41 19s. 6d.; Siemens-Martin acid, £49 0s. 6d.; spring steel, basic, £44 4s. 6d., spring steel, acid, £52 19s. Glazing tees, £47 0s. 6d. Sash and casement sections, £43 13s. 6d. Gate channels, £50 17s. 6d. Ferro-concrete bars (10 tons to under 500 tons), £39 10s.

**Sheets and Strip.**—Uncoated strip mill coils, hot rolled, under 3 mm. to 12g., mill run, mill edge, 25 tons to under 50 tons, £43 16s.; cold reduced, 17/20g., side trimmed, skin passed, £49 16s. Black sheets, 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £68 5s. Cold-rolled steel strip, coils, hard temper, not annealed, 10 tons to under 20 tons, £55 5s. Hot-rolled hoop and strip, u/t soft basic, 100 tons and over, £38.

**Tinplates.**—Cold reduced, hot dipped, 15 tons to under 50 tons, 66s. 8d. per basis box of 108 lb., f.o.t. makers' works. Cold reduced electrolytic, 59s. 9d. per basis box.

**Colliery Rails and Arches.**—Arches, 4 in. × 2½ in. × 2 in., re-rolled £39 15s., 3 in. × 3 in., re-rolled £40, 3½ in. × 3½ in., re-rolled £40 7s. 6d., 4 in. × 2½ in. × 2 in., prime £44 6s. 9d. Other sections, prime £44 11s. 9d. Extra fishplates, £52 10s. Cambered girders, 4 in. × 2½ in. × 2 in., re-rolled £38 9s., 3 in. × 3 in., re-rolled £38 11s. 6d., 3½ in. × 3½ in., re-rolled £38 18s. 6d., 4 in. × 2½ in. × 2 in., prime £43 4s. Other sections, prime £43 6s. 6d. Benk bars, standard type, prime material, all thicknesses, £38 11s.; re-rolled, up to ¾ in., inclusive, £37 6s.; over ¾ in., £38 11s. "W" type bars, prime steel, all thicknesses, £41 1s.; re-rolled, up to ¾ in., inclusive, £39 16s.; over ¾ in., £41 1s.

**Bright Steel** (10 tons to under 20 tons).—Bars, no analysis or test, £52 8s. 6d.; flats, untested, £70 3s. 6d.

**High-speed Tool Steel.**—Finished bars, 5% cobalt, 10s. 10d.; 14% tungsten, 6s. 11d.; 18% tungsten, 7s. 9d.; 22% tungsten, 9s. 2d.; 4/6 quality molybdenum tungsten, 6s. 3d.; 6/6 quality molybdenum tungsten, 6s. 5d.; 5/6/2 quality molybdenum tungsten vanadium, 6s. 7d. per lb.

**Rails, etc.**—F.B. rails, heavy, 75 lb. to under 90 lb., 500 tons and over, f.o.t., £39 15s.; fishplates for rails 80 lb. and over, 50 tons and over, f.o.t., £53 11s.; soleplates, f.o.t., 100 tons and over, £51. Light flange rails, 25 lb. and under, d/d N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over, £40 17s. 6d.; fishplates for light rails, 50 tons and over, £50 12s. 6d.

## BLAST-FURNACE COKE

*(F.O.T. at Ovens)*

DURHAM AND NORTH-EAST COAST: 159s. 3d. SOUTH WALES: 158s. NOTTS AND DERBY: 135s. 5d. LANCASHIRE: 146s. STAFFORDSHIRE: 139s. 5d. YORKSHIRE: 138s. 8d. SCOTLAND: 169s. 4d.

(All prices are subject to quality differentials.)

## STEELWORKS SCRAP

(Plus 5 per cent. in the case of sales by merchants.)

| | Scotland. | N.-E. Coast. | Midlands. | Sheffield. | Lancs. | S. Wales (East) | S. Wales (West) |
|---|---|---|---|---|---|---|---|
| | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| Heavy steel scrap* | 229 3 | 228 3 | 220 0 | 226 3 | 226 3 | 227 3 | 232 3 |
| Heavy mixed scrap* | 207 3 | 206 3 | 198 6 | 204 3 | 203 9 | 205 3 | 210 3 |
| Heavy steel turnings† | 179 9 | 179 9 | 169 9 | 176 9 | 174 3 | 177 0 | 180 0 |
| Heavy cast iron† | 206 9 | 203 9 | 208 0 | 204 3 | 189 3 | 199 3 | 205 9 |
| Cast-iron borings† | 160 3 | 157 3 | 157 0 | 159 9 | 157 3 | 159 6 | 164 6 |

* Basis 500-ton lots in England and Wales and 250 tons and upwards in Scotland, delivered.
† Not less than 250 tons in England and Wales, 100 tons in Scotland.